

PHANTOM FLEET OF THE HIGHWAY

# POPULAR MECHANICS

MAC

WRITTEN

REGD. TRADE MARK GREAT BRITAIN PAT. 40088

**MAY  
25 CENTS**

**SEE PAGE 687**





## 3 GRADES OF GAS—3 Grades of Car Performance



### HERE'S WHY POWER DEPENDS ON THE GRADE OF GASOLINE YOU USE

You'd be surprised to hear some of the "dizzy" ideas uninformed people get about their cars. They even expect top-grade performance from low-grade gasoline. Here's what a man can reasonably expect... and why:

TESTING CAR PERFORMANCE on different grades of gasoline at an Ethyl Motor Clinic.

#### Poor performance

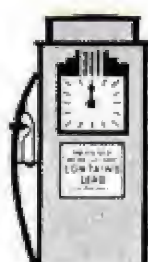
with "low-grade" gasoline



There is no anti-knock fluid (containing tetraethyllead) in "low grade" gasoline. Power is lost because the spark *must* be retarded by your car dealer to prevent "knock" or "ping."

#### Good performance

with "regular" gasoline



Most regular gasoline has in it anti-knock fluid (containing tetraethyl lead). The spark can be considerably advanced for more power without "knock" or "ping."

#### Best performance

with gasoline containing "ETHYL"



Gasoline "with ETHYL" is highest in all-round quality. It has *enough* anti-knock fluid (containing tetraethyl lead) so that the spark can be *fully* advanced for maximum power and economy without "knock" or "ping."

**ETHYL GASOLINE CORPORATION**, manufacturer of anti-knock fluids used by oil companies to improve gasoline



# YOU CAN DEPEND ON CHAMPIONS



When an outboard racing driver guns his eager, whining mount across the starting line, his hopes are firmly pinned on a few all-important factors in his engine—not least among them spark plugs—to see him first across the finish line.

Like most racing drivers who look only for the utmost in dependability and performance from their spark plugs, the champions of outboard racing, almost without exception, use Champions exclusively.

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Douglass C. Fonda, sensation of the 1937 outboard racing season, achieved a record never before compiled by a single driver in one year. Winner of three national awards, he always uses Champions "because of their absolute dependability."

Every engine, whether automotive, aircraft, marine, truck, tractor or stationary, will perform better with Champion Spark Plugs.

Demand Champions because you can depend on them. Wherever

you find good service you will find a Champion dealer.

## Champion "V" Spark Plugs



$\frac{3}{8}$ " 24 Thread  
Actual Size, 65c

Specially designed for model gas engines giving the same dependable performance as regular Champions. Absolutely gas-tight, alloy needle point electrode, one-piece construction. If not available through your dealer, write Champion Spark Plug Company, Toledo, Ohio.



# FIRST CHOICE OF MILLIONS

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POPULARLY  
PRICED!**



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are justifiably proud of their investments in G-E Refrigerators. Last year America bought more G-E refrigerators with the famous automatic Thrift Unit than ever before. And this year a General Electric is even a bigger buy! Every 1938 G-E model has the famous hermetically sealed-in-steel Monitor Mechanism that carries 5 years performance protection.



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2. **THRIFTY IN CURRENT!** Now produces more ice, more cold, with even less current.
3. **THRIFTY IN UPKEEP!** An unsurpassed record for enduring economy and long life.

GENERAL ELECTRIC CO., SPECIALTY APPLIANCE DIVISION, NELA PARK, CLEVELAND, OHIO

These three are the *all-important* refrigerator values. But with a new G-E you get multiple additional savings—savings in food, in ice, in time, etc. It's the *thrifty* refrigerator to buy and to use. Get *full* value for your dollar—see the new G-E 1938 models. Now on display.

# GENERAL ELECTRIC

THE ORIGINAL ALL-STEEL REFRIGERATOR

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# Popular Mechanics Magazine

H. H. WINDSOR, Founder

H. H. WINDSOR, Jr., Editor and Publisher

May, 1938

Vol. 69, No. 5

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## U. S. Drivers vs. the World

**A**UTOMOBILE racing has gone international with the result that European cars and drivers, backed by government funds, will compete this year with the best America has to offer. Pitted against this well-heeled foreign invasion will be a fleet of Yankee cars built piece by piece in small machine shops and then assembled in back-yard garages. In some cases old engines and bodies have been rebuilt to meet the foreign challenge. In other cases, owners and drivers have pooled everything they possess to construct new cars. But unequal as the competition appears, almost anything is likely to happen when America meets the world this year at Indianapolis and Roosevelt Raceway. An article in the June issue may enable you to pick the winners in advance because it gives you the strong and weak points of both the American and European cars.

## Next Month

**B**EING a poor fish today has its advantages. Doctors and dieticians labor to guard your health while fish architects work to supply a comfortable home. But here's the catch. It's all done so you'll be ready for some angler next summer. Restocking depleted waters with game fish has become big business as you'll find by reading "Don't Pity the Poor Fish," next month. There are eight pages of Coloroto pictures.

## Modern Paul Bunyan

**P**AUL Bunyan, mythical superman who mowed down forests, has a modern counterpart—a woodsman who can fell a forest giant and drag it to market singlehanded. But this modern Paul Bunyan does it with hoist drums, tractors, electric log carriages, automatic skidders, Diesel trucks. An article next month reveals how the lumberjack has become a forest technician.

## Riches from the Air

**M**AN today is squeezing riches from the air—riches in the form of nitrogen, a substance more precious than gold or diamonds. The story of nitrogen is an amazing tale of human achievement interspersed with touches of irony because without nitrogen we should starve but, by nitrogen, sometimes, we die. Don't miss this article next month.





**PISTON HAPPY:** "Probably your owner doesn't know that Pyroil will stop all that sludge, carbon and gum from stealing your vitality and power."

**PISTON SAD:** "I wish someone would tell him. I'm on my last legs right now."

**PISTON HAPPY:** "I sympathize with you. I used to get that way, too—before my owner began using Pyroil."

**PISTON SAD:** "Oh, my head!"

**PISTON HAPPY:** "Poor fellow. His owner will soon have to foot a big bill for restoring him—for carbon removal, sticky valves, or even more serious trouble. Yet only a few ounces of Pyroil could prevent all of that! Poor fellow."

Don't let carbon, gums, sludges—and corrosion—steal pep and power from your car—to bring about early wear and costly damage. Pyroil safeguards against these. It offsets repairs. Yet it costs only a few cents per treatment! Ask at your service station, or mail coupon. Manufactured and Guaranteed by Pyroil Company, W. V. Kidder, Founder, 55 Pyroil Bldg., La Crosse, Wisconsin, U. S. A.



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## A 4-Year Loafer Graduates with Honors

*Idling in the wood 4 full years  
BRIGGS comes forth as the world's  
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At 15¢ the tin, Briggs costs a few cents more than ordinary uneducated tobaccos. But those extra pennies are *miracle* pennies . . . in the extra enjoyment they bring to your smoking. Ask any Briggs smoker.

# BRIGGS

# 4

CASK-MELLOWED

FULL YEARS



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## WHERE DO YOU GO FROM HERE?

**Y**OU'RE like a million other men—you're facing a big question. The depression turned business topsy-turvy and now the rebuilding period stares you in the face.

Are the things that are happening today going to help or hinder you—what will they mean in your pay check? Where will they put you five, ten, twenty years from now? How can you take full advantage of this period of opportunity?

We believe you will find the answer here—a suggestion the soundness of which can be proven to you as it has been to thousands of other men.

The whole trend today—legislation, spirit, action—is to put men back to work, raise earning and spending power, *give every man a fair chance to work out his own salvation.*

The road to success remains unchanged but, bear this in mind, *what it takes to win is radically different!*

No employer today would dare risk an important post in the hands of a man who had not learned the lesson of '29. Why should he, when right at this moment he can pick and choose and get almost any man he wants at his own price?

Business organizations are rebuilding—reorganizing for the new conditions. Before it is over every man and every method will be judged in the cold light of reason and experience—then dropped, re-made or retained. This spells real opportunity for the man who can meet the test—but heaven help the man who still tries to meet today's problems from yesterday's standpoint! Out of the multitude still

jobless there are sure to be many frantically eager to prove him wrong and take his place.

### Some Men Have Found the Answer

Seeing these danger signs, many aggressive men and women are quietly training at home—are wisely building themselves for more efficient service to their employers.

You naturally ask, "Has your training helped men withstand conditions of the last few years?"

Our answer is to point to a file of letters from many of our students reporting *pay raises and promotions while business was at its lowest ebb*—together with a myriad of others telling of greater success during these recent months of recovery.

Amazing evidence is ready for your investigation. We have assembled much of it in a booklet that is yours for the asking, along with a new and vitally interesting pamphlet on your business field.

This is a serious study of the possibilities and opportunities in that field. It is certain to contain an answer to vital questions bothering you today about your own work and earning power.

Send for these booklets—coupon brings them free. Be sure to check the LaSalle training that interests you most. We will tell you also how you can meet and take fullest advantage of today's situation. No cost or obligation—so why not mail the coupon now?

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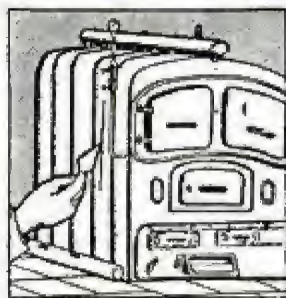


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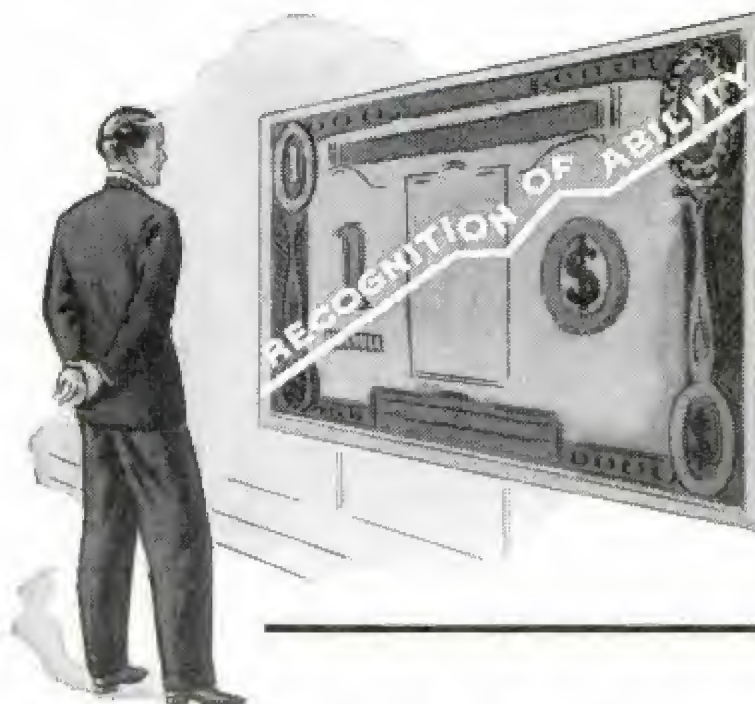
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### IMPORTANT NOTICE

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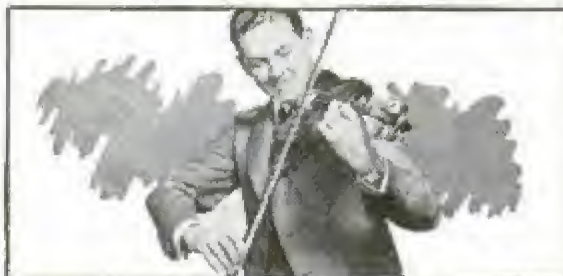


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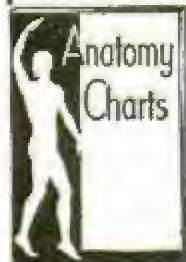
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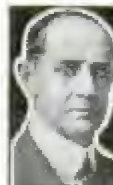
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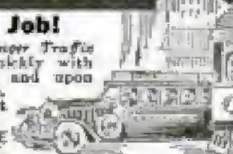


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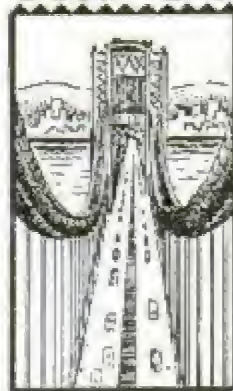
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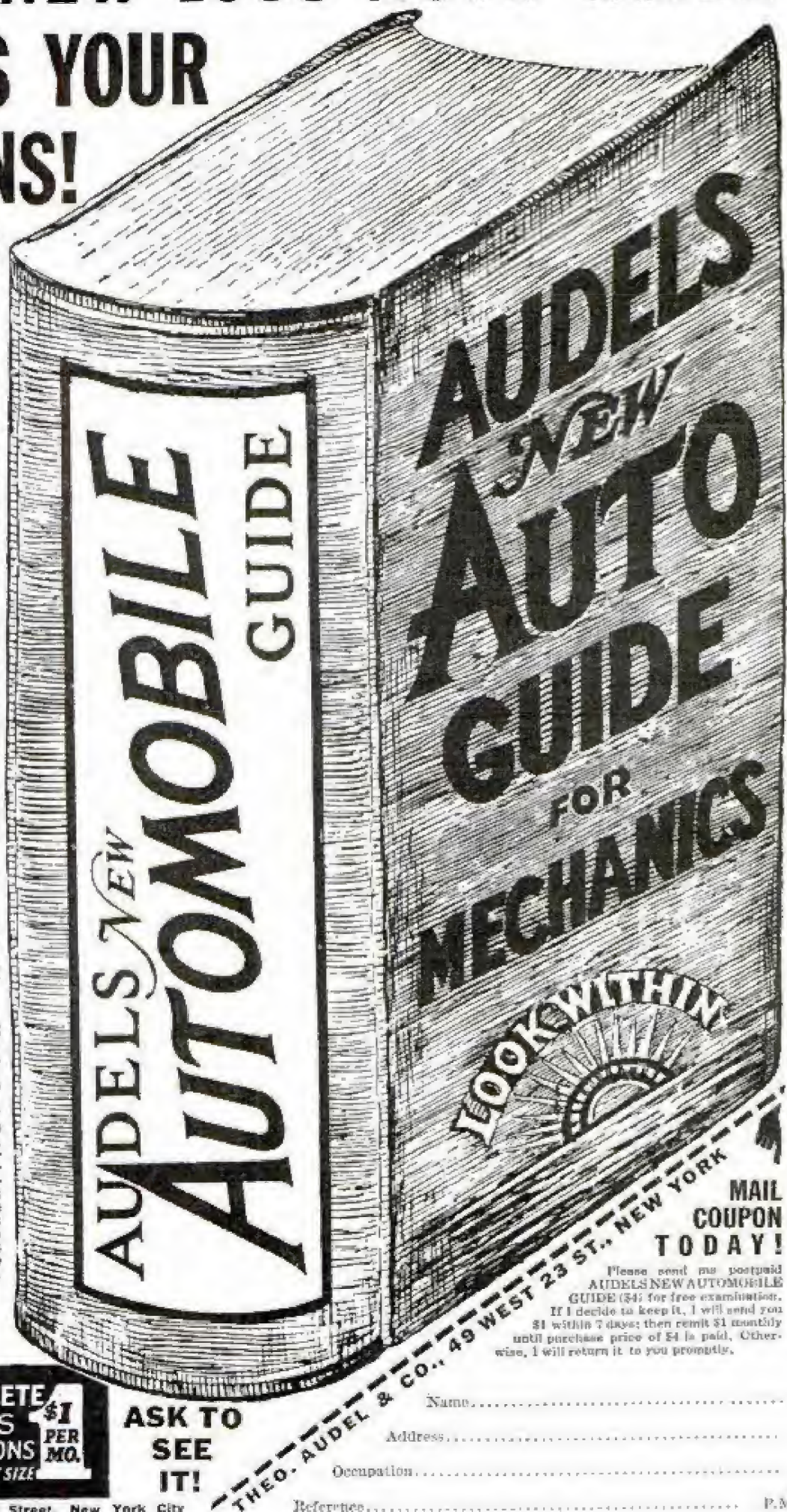
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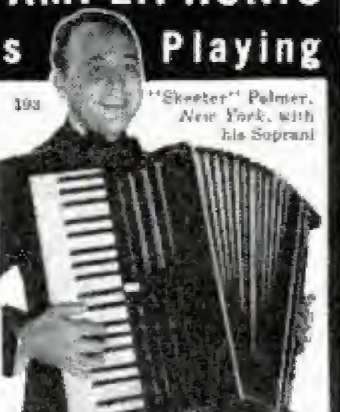
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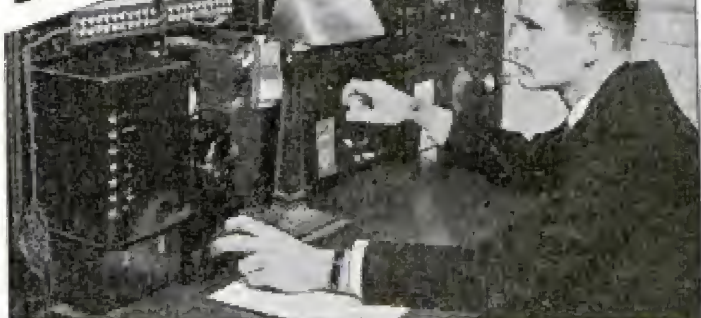
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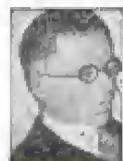
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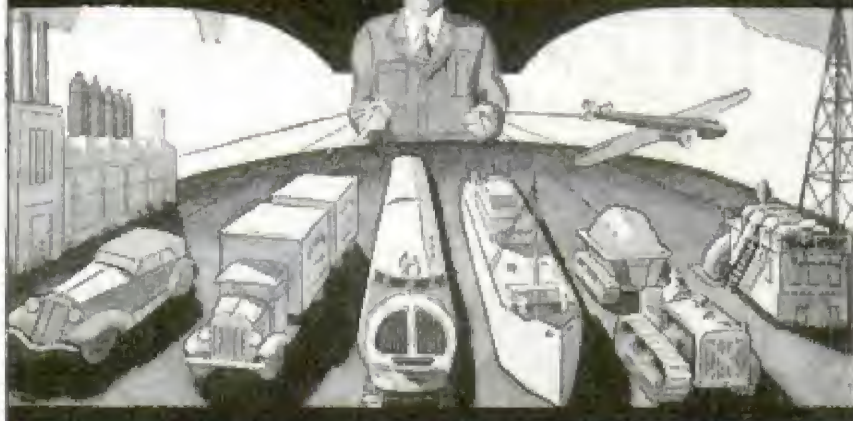
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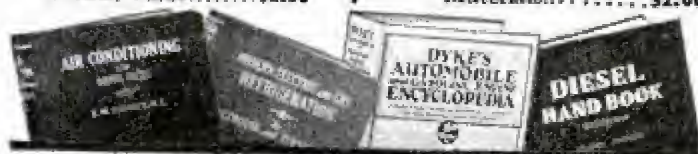
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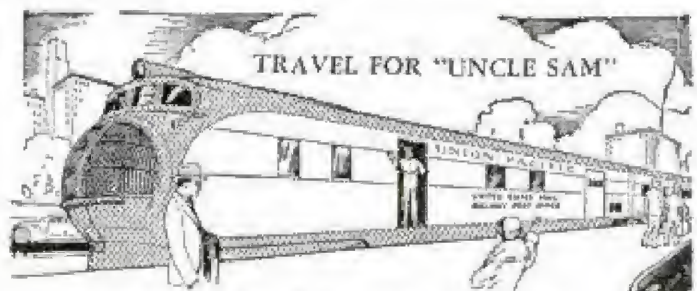
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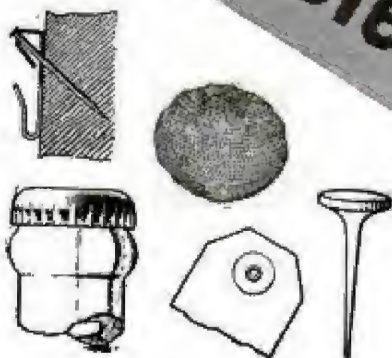
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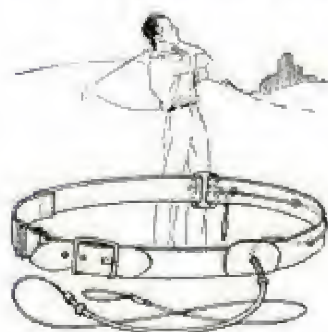
The jacket is delineated on its exterior to resemble live bait. It can be opened and closed

to facilitate filling and emptying of the jacket with bait material of the desired color. Coloring matter comes in a tube.

**I**NTEENDED to prevent the cow from switching her tail into the milker's face or the milk bucket, a special garter has been patented. One end is attached to the cow's tail, the other to her left leg. In order that movement be not restricted too much, the garter is made of an elastic material which will give slightly.



**F**OR controlling and directing the swing of a golf club, a body harness has been patented. It comprises a hip girdle with means for adjusting its girth, a cord connected at one end to the girdle at the left hip of the golfer and at the other end to the neck of



the club. The cord is adjustable for length. Then, if it is kept taut while the golfer swings, the club head is forced to swing in a circle about the golfer's left hip in the proper playing position.

**F**OR the sports fan, particularly a spectator at golf matches and similar events,

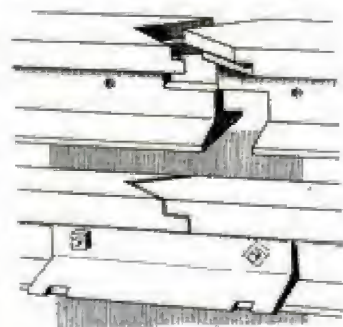


a newly patented stool provides support for the body and reduces fatigue. It consists of a supporting post, at the top of which is a small seat with waist and leg straps.

The stool does not have to be removed when its user is walking. When it is in use for a seat, the supporting post assumes an almost vertical position. The straps are partly resilient, so that they yield to the various movements of the body in walking and sitting.

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fits. Then the two rails are bolted together. The V-head eliminates all deviation to right or left, especially on curves. This

(Continued to page 34A)



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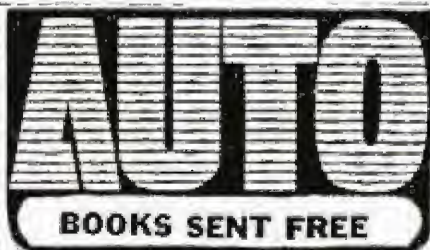
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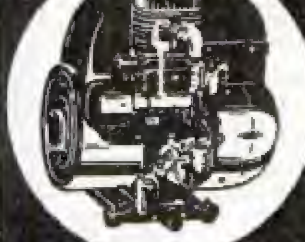
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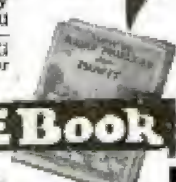
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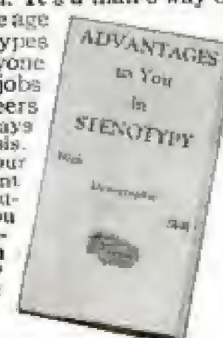
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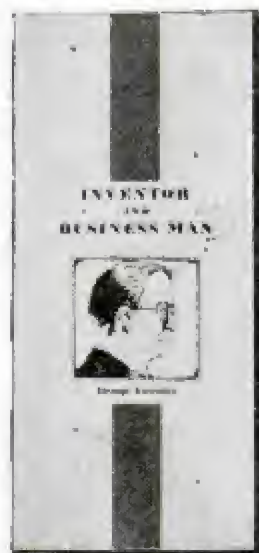
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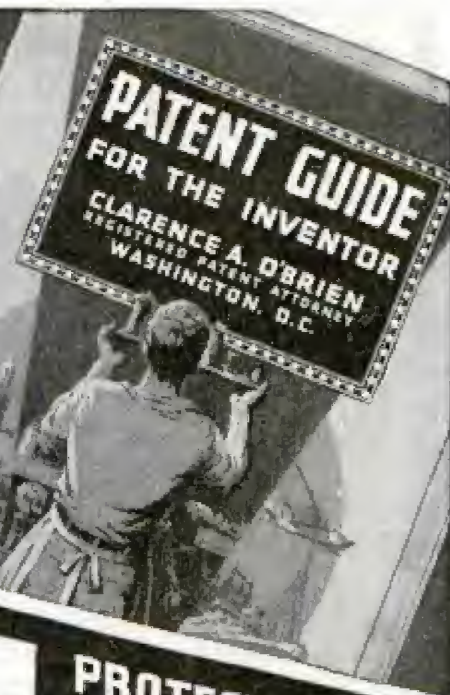
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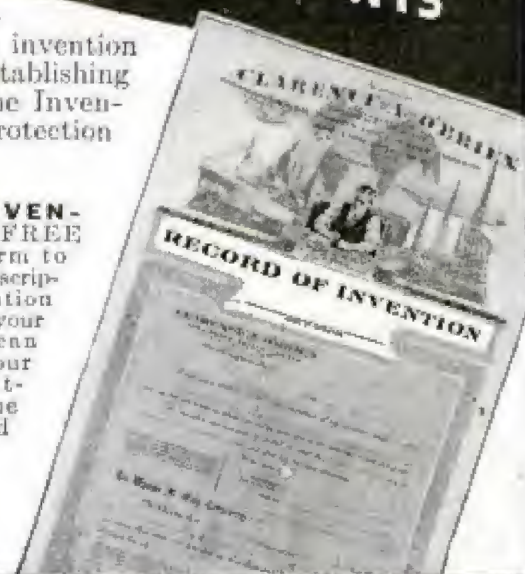
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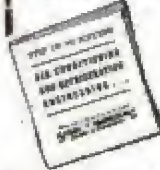
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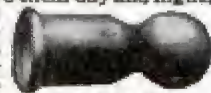
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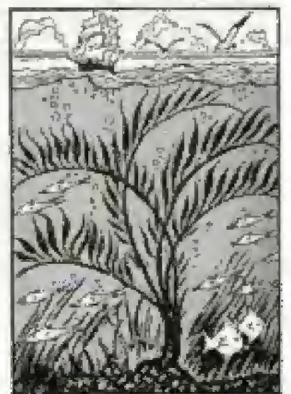
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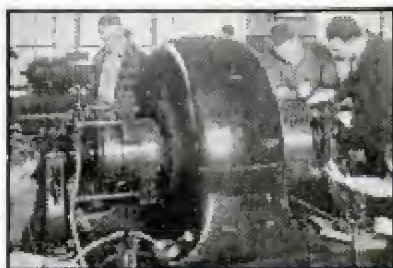
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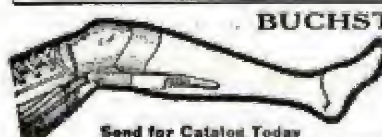
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FOB Factory

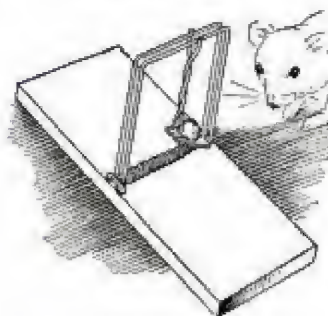
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## NEW INVENTIONS

(Continued from page 24A)

joint is said to prevent splitting common to square joints and to extend the life of rails considerably.

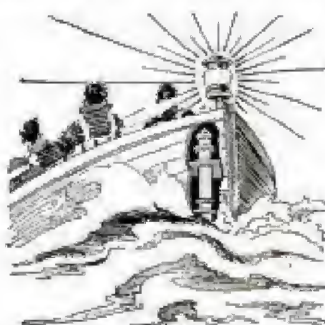
**CATCHING** the rat or other small animal on either side of the bait is made



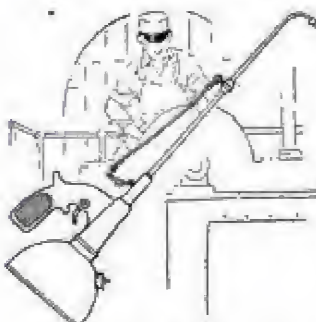
possible by a patented trap with two springs located at the center. These springs are arranged so that they fall on opposite sides when the rat attempts to get the bait. At

the inner end of the bait holder is a trigger forked at its outer end to provide sensitive engagement with the trapping springs when the trap is set.

**GREATER** safety at sea is the purpose of a newly patented automatic electric light for life-boats. The electrical circuit is set in motion when the boat enters the water and the light may be used as a continuous signal. When the sea water enters a well in the bottom of the boat, it acts as an electrolyte for a voltaic-cell generator, thus energizing the cell and providing current for the light. When the boat is removed from the water, this action stops.



**OILING** machinery is made easier by a pistol grip oilcan patented recently.



The can has a reservoir in which the lubricant is contained and mechanism for expelling the oil in the quantity desired when the trigger of the pistol is pulled. The

can has a long spout for reaching otherwise inaccessible parts.

(Continued to page 37A)



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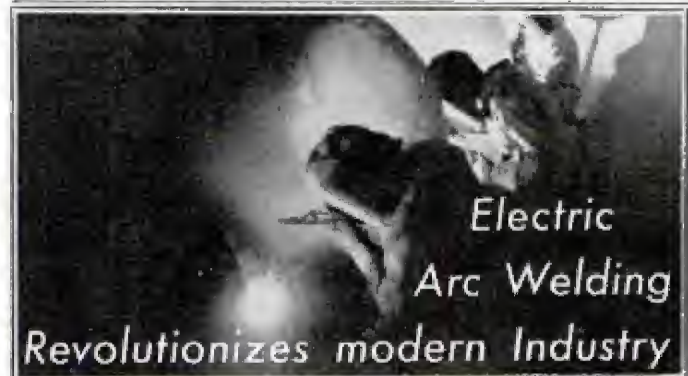
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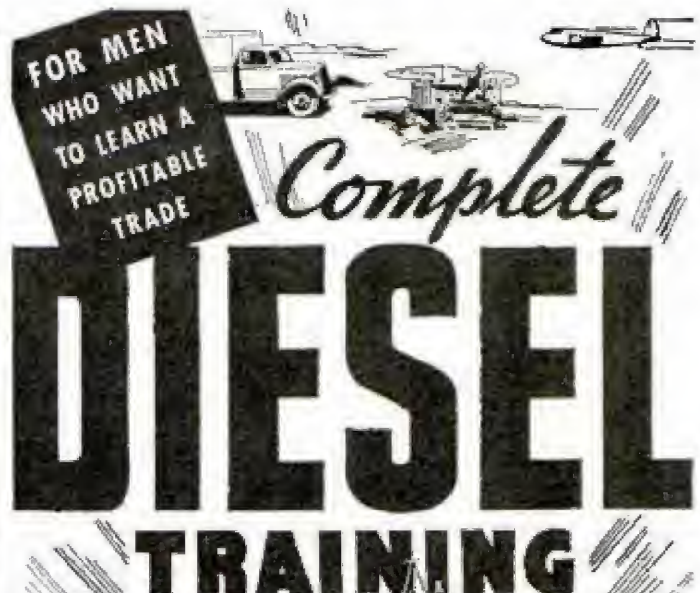
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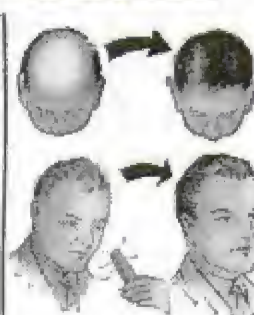
stunted hair roots, stops falling hair, and results in new growth of hair. Yes, results are obtained even in many so-called hopeless cases of baldness.



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The illustrations above explain the Rand principle of growing hair. At left is a starved hair root—too weak to shoot hair through the scalp. At right is a strong, active hair root—GROWING HAIR—because it is properly nourished by rich blood supply.

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**SEND NO MONEY—YOU PAY ONLY IF SATISFIED**

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Rand Hair Grower Company, Dept. H-1662

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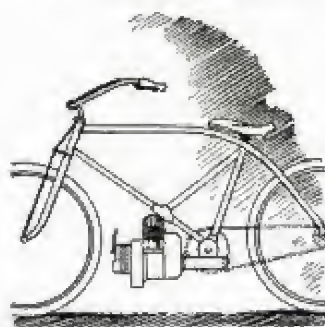
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## NEW INVENTIONS

(Continued from page 34A)

**A**TTACHMENT of a small motor to a bicycle is made possible by a form of

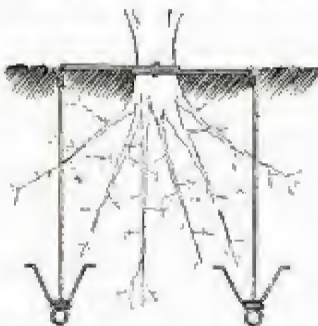


construction patented recently. The motor is mounted between the front wheel and the drive sprocket. Gears connect the motor to the sprocket, for propulsion. A special

reinforcing bar between parts of the bicycle frame helps to support the weight of the motor and to increase resistance to the motor's vibration.

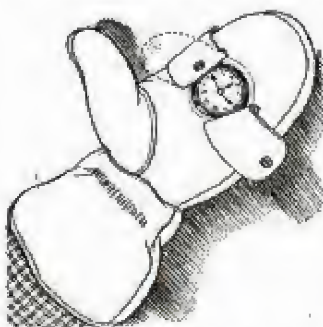
**P**REVENTION of theft of small trees and plants is the purpose of a device patented recently.

It consists of an attachable collar which is fastened closely around the plant stem or tree trunk directly above the roots to prevent removal of the rooted portion.



One or two ground engaging anchors attached to the collar prevent removal. The anchors are buried in the ground adjacent to the plant.

**F**OR timing speed events in winter, a mitten with an opening in the palm for



a stop watch has been patented. The opening is smaller than the watch, to keep the watch from slipping out, but permits full view of the watch face. The watch is in-

serted through a slit at one side. A flap adjacent to the slit has a small opening for the knurled stem of the watch. Snap fasteners on this flap and another on the other side of the palm provide for closure when the watch is not in use.

(Continued to page 55A)

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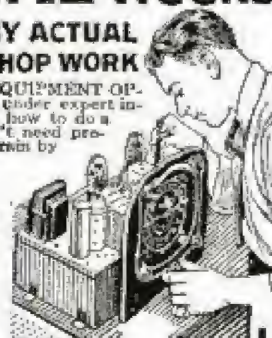
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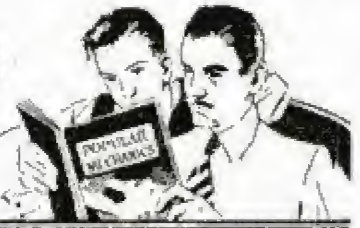
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**INSIDE** Dealer prices. Overstocked, all models. Indians and Harleys. Rebuilt, guaranteed. Dime brings latest list. Crandall-Hicks, Boston, Mass.

**RECONDITIONED** Motorcycles. New—used parts for all makes. Authorized Harley-Davidson dealer. Whitman Motorcycle & Supply Co., 405-9 Southwest Blvd., Kansas City, Mo.

**SEND** 15c For illustrated used motorcycle catalog. Bargains. Largest stock genuine Indian parts and motorcycles. Indian Motorcycle Sales, Kansas City, Mo.

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**MODELS.** Aeroplanes, scale flying type, 10c coin for 16 page catalogue. Miniature Aircraft Corp., 83 Low Terrace, New Brighton, New York.

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**PROPELLERS** —Sled-airplane, lowest prices. Catalog 10c. Woodcraft Propellers, Hillside Station, Wichita, Kansas.

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**HEATH** Airplane, motor, propeller literature, dime. Heath Aviation Company, Benton Harbor, Michigan.

**PROPELLERS** For airplanes, sleds. Also iced blueprints. Catalog dime. Lorenzen Propellers, Niles, Michigan.

**SENSATIONAL** Aeroplane with motor purchase. Terms. Propellers, 92c up. Information, 25c. Universal Aircraft, Ft. Worth, Texas.

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**BUILD** Wind light plant. We show you how. Complete plans and valuable catalog 10c. Wind plant parts, welders, electric fences. LeJay Mfg., 647 LeJay Bldg., Minneapolis, Minn.

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**GIANT** Gadget kit. Screws, nuts, washers, rivets, bolts, bushings, springs, tapping screws, lockwashers, gears, brackets, etc. Ten pounds—over 1,000 items. Price \$1.49—worth \$7.50. Money back guarantee. Manufacturers Supply House, 219 W. Illinois, Chicago.

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**ASSEMBLE** Your own boat. Our finished knock-down frames and materials save you 2/3 builder's cost. All types and sizes. Send 25c for big catalog. Brooks Boat Co., Inc., D4, Saginaw, Mich.

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**OUTBOARDS**—Save 1/2. Good used parts, all makes and models. Bargains rebuilt motors. Crandall Hicks Co., 959 Commonwealth, Boston, Mass.

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**LENS** Kit—Makes 3" diameter, 75-150 power telescope. \$1.00 postpaid. Optical Works, Milton, Penna.

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**LARGE** Professional magic catalogue, 25c. Holden, 320 W. 42nd St., New York.

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**SVENOALI** Magic decks, Bridge size, new style. Demonstrators sell them for one dollar. Dozen \$3.25. Sample postpaid thirty-five cents. Catalog 300 jokes and magic free. Adams Company, Asbury Park, N. J.

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50 OLD Coins, all different, \$1.00. 20 different dates large cents \$2.00. 10 different dates half-dimes \$1.50. Claud Denney, Box 1825, Dallas, Texas.

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INDIAN Head pennies wanted. Send 10c for buying list. Lee's Stamp & Coin Shop, 210 North First, Phoenix, Arizona.

SPLENDID Buys for your hobbyists. Old U. S. coins, stamps, newspapers of Washington and Lincoln days. Old relics of many Indian tribes, etc. Enclose dime to cover printing, mailing. F. Shontz, Box 5, Station A, New York City.

SOME Specimens 1909 cent worth \$10. We buy certain coins, common and rare. Others worth to \$6000; certain 1864-1865 Indian head cents \$100 each; dimes before 1895, \$450; Liberty head nickels before 1914, \$300; large pennies \$2000; encased postage stamps, \$13; half cents, \$275; half dimes, \$175; quarters, \$300; fractional currencies; paper money; gold dollars, \$1,500; colonial coins, \$300; silver dollars, \$4,000; 1933, 50c, \$4.00; foreign coins \$165, etc. Only certain coins worth top prices, but others have premium value too. Send 15c today for illustrated 1938 coin book, before sending coins. National Coin Corp., (82), Daytona Beach, Florida.

COMMEMORATIVE Half dollars, Lincoln, Stone Mountain, Oregon, Texas, Cleveland, Kentucky, San Diego, Long Island, \$1.50 each. Illustrated catalogue No. 14, 25c. Norman Shultz, Salt Lake, Utah.

\$5.00 TO \$2500.00 Paid for rare coins. Send 15c for 1938 newest 36 page illustrated coin buying book. Charles Fisher, (1) Chagrin Falls, Ohio.

FREE! Foreign coin, banknote, and large illustrated coin catalogue. Send 4c postage. Coin approvals sent. Tatham Coinco, Springfield-125, Mass.

GET Profit and pleasure in collecting old coins. Send 10c for 58-page illustrated coin catalog. You'll be delighted with it. Send for it now. B. Max Mehl, 378 Mehl Bldg., Fort Worth, Texas. Largest rare coin establishment in U. S. Established 38 years.

\$5 TO \$500 Each paid for hundreds of old or odd coins. Keep all until posted. Many very valuable. Send 10 cents for illustrated Coin Value Book, 4x6. Guaranteed buying and selling prices. 31 years in business. Coin Exchange, Box 5, Le Roy, N. Y.

UNITED States coins at bargain prices. 2c piece and newest 1937 selling price list 10c. Em. Cohen, Box 3507, Cleveland, Ohio.

RARE U. S., foreign coins, war medals. Catalogue 10c. Mengelle, Colorado Springs, Colo.

UNITED States. Large cent, 3c bronze, 3c nickel and bargain list, 25c. Eleven dates large cents, \$1. George P. Coffin Co., Augusta, Maine.

#### STAMP COLLECTING.

U. S.: 50c clipper 20c; park set complete 25c; 100 assorted large commemoratives 40c. Wholesale pricelist 10c. Many Lincoln pennies are valuable; pricelist 10c. Al. Johnson, Crescent, Colorado Springs, Colorado.

PAPUA 1907, 1/2d (catalog 40c)—only 12c. Free stamps and "hinger" given approval applicants enclosing 3c postage. W. Torgesen, Teaneck, N. J.

SPECIAL 100 Mixed foreign 10c. If not satisfied, return pkgs. and money back guaranteed. Frank Strosky, Box 53, Perth Amboy, N. J.

NEW Rivera nude stamp! World's largest triangle! Congo, Sudan, South Seas, bicolors, pictorials and many others. Only 3c with approvals. Cactus Junior Approvals, Box 1870-B, Tucson, Arizona.

FREE World stamp map—Complete set K. Edward VIII with 1938 catalogue of Canada postage and revenues and British North America 200 illustrations for 25 cents. Special 75 Canadian revenues 65 cents. Vincent, 294 St. Catherine, West Montreal.

A SNAP—300 Different foreign and 60 different U. S. stamps, including \$1 value, for only 30c. Free with each order, our pamphlet telling "How To Make A Stamp Collection Property," together with our price lists of albums, supplies and hundreds of bargains in sets, packets, etc. Queen City Stamp Co., Room 36, 604 Race St., Cincinnati, Ohio.

WORLD'S Smallest airmail, free stamp magazine, \$2.00 U. S. animals, bird, train, Indian, airplane, commemoratives, scarce stamps 25 countries, 5c with approvals. Capital Stamps, Dept. PM7, Little Rock, Arkansas.

1897 GRAND Comore Islands, rare old genuine Baden, Turks Caicos, \$5 U. S. British Colony map stamp, Western Samoa, etc. Everything 3c with approvals. Viking 1-2 Hanson Place, Brooklyn, N. Y.

FREE Stamp catalogue: 1938 summer edition—Giant forty-page quarterly listing albums, supplies, coronations, colonials, Canadians, United States and foreign sets. Illustrations galore! Empire Stamp Co., Dept. P. M., Toronto, Canada.

OPPORTUNITY! Triangles from several countries, U. S. commemoratives and old issues; over 50 others cataloging up to 50c each. Everything 10c to approval applicants. Gardner, 5220 Cuthbert, Baltimore, Maryland.

8 AIRMAILS From Syria, Lebanon, Austria, etc., and 55 others, 5c to approval applicants. Barker, Box 488, San Francisco.

NEWFOUNDLAND Stamps including some jubilees, coronation, Gilbert. Thirty different; bargain one dollar. No approvals. Bourne's, Box 42, Greenspond, Newfoundland.

100 DIFFERENT 12 United States commemoratives 10c. Approvals one and two cents. Dykeman, 6026 Trinity Place, Philadelphia, Penna.

FREE! Set world's largest airmails 3c postage. Request approvals. Supreme, 1920 Douglass, Brooklyn, N. Y.

100 DIFFERENT Stamps and mint air mail set all 5c to approval applicants. Leo, 853 North Martel, Los Angeles, Calif.

BICOLORED Triangle, etc. 201—10c. Wehrli, 875 Main, Passaic, N. J.

HINDENBURG Zeppelin (plenty scarce) 10c. Approvals. Royal Stamp Co., Box 5944, Kansas City, Missouri.

3,000 DIFFERENT Mounted in booklet \$17. 200 Belgium, 25 Congo \$1. Lecomte, Rue Frere Orban, Jumet, Belgium.

HINDENBURG Zeppelin (catalogs 35c) 5c with approvals. Shultes, Berne, N. Y.

100 DIFFERENT Swedish 50c. B. H. Lindgren, 425 Park Street, Woodstock, Illinois.

MYSTERIOUS Jungle packet, 5c to approval applicants. Roxy Stamp Co., 448 Wyandotte E., Windsor, Ont., Canada.

H. C. ANDERSEN commemoratives between 25 to 50c. Lumbye Hillerodgade 29, Copenhagen.

U. S. 6c 1918 airmail used, catalogue 85c for only 25c. U. S. or foreign approvals with each order. W. C. Phillips, 750 Main St., Hartford, Conn.

LOW Priced stamps on approval if you send references. Threlfall Brothers, Box 6811 D, Philadelphia, Penna.

FREE! 125 Stamps to approval applicants sending postage. Quality Stamp Shop, Englewood, Colorado.

BEAUTIFUL Ecuador, U. S. constitutions only 5c with approvals. Buckley, 208 Ludlow, Dayton, Ohio.

AT 1/10 Catalog. U. S., British Colonies. Meyerowitz, 1756Y 70 Street, Brooklyn, N. Y.

SIX Beautiful triangles 10c. Approvals. Amazing values. L. D. Gibson, B-203, Bandana, N. C.

250 WELL Mixed foreign stamps, world wide, 15c. Wilfred Brophy, Galesville, Wis.

NEW! 3 Costa Rica diamond airmail (beauty), 25 British Colonies, 6c approval applicants. Lejac, Chowchilla, Calif.

FREE Price list of pictorial stamps. Bargains galore. Send now. Willard Pugmire, 1314 South 54th, Tacoma, Wash.

BOLIVIA 80 Different including 12 airmail \$1. Carlos Gerke, Sucre, Bolivia.

ECUADOR—Thousand mixed \$2.00. Ten thousand \$18.00. 75 different \$1.00. 125, \$2.00. America 500 different \$4.00. List free. Perrone and Campana, Box 749, Guayaquil.

FREE! Beautiful triangle stamps. Approvals. Beacon, Box 371, Hampton, Va.

FREE Pocket wallet with prizes. Send stamp. Approvals. R. S. Hanson, Savanah, Illinois.

FREE, Magnifying glass, with three Costa Rica diamond stamps, 10c. Approvals. Spartan, 3420 Grey, Montreal, Canada.

MONTHLY Stamp and coin magazine, six months and 25 foreign stamps, 25c. American Stamp Journal, Cedar Rapids, Iowa.

PRODIGIOUS Gift! Fantastic Indochina, German state, savage Somaliland, Perak, Selangor, Negri Sembilan, bicolor Banana airmail, Siberia. Absolutely free with approvals! Postage 3c. Saxon Company, Dept. 65, Albee Bldg., Brooklyn, N. Y.

JOIN Big stamp club. Camel stamp and airmail together with mammoth world stamp packet. Approvals. 10c. Atlas Stamps, Little Rock, Arkansas.

1000 MIXED United States 18c. 2 pounds \$1.00. Halay, 452 West 58th, New York.

GENEROUS Offer! Triangles from three countries, Afghanistan, Newfoundland commemorative, giant map stamp, United States \$5.00 stamp, over fifty different others. Everything 10c to approval applicants. Tru-Value, Box P1412, Hartford, Connecticut.

ANNOUNCING The arrival of the long and eagerly awaited Ecuador U. S. Constitution sets. These stamps are the most beautiful of the Constitution series so far issued. They are printed in 5 different colors, showing the U. S. flag in red, white and blue, the American eagle, George Washington, etc. We will send 4 values (2 postage, 2 airmail) for only 10c to approval applicants and will also send "on approval" all the other U. S. Constitution stamps issued by 11 different countries, together with our free monthly bulletin, describing them in full detail. Approval Headquarters, Globus Stamp Co., 268 - 4th Avenue, New York City, Dept. 201.

MIXTURE—600 Liberally priced, \$1.00. Anderson, Box 1203, Rapid City, S. Dak.

\$1.18 CATALOGUE—Belgium charity set—free with 55 variety packet including Costa Rica triangle, ant-eater provisional, Transvaal, Venezuela, for dime with approvals. L. & S. Stamp Mart, Box 24, West Hartford, Conn.

100 U. S. Commemoratives, imperforates, etc., 25c; 150, \$2.00. Williams, Box 774, Anson, Texas.

WALLET Overflowing with stamps: Diamond-shaped, pictorials, Stamp dictionary, Everything 3c. Approvals. Laffal, 91-61B 102nd St., Richmond Hill, New York.

FARLEY'S Polities novelty miniature sheet 10c. George Brodie, 5417 - 8th Avenue, Brooklyn, N. Y.

150 GOOD Mixed foreign stamps, 3c. Elvin Stanton, Niantic, Conn.

BRAZIL! 25 Different 5c, approvals. Arnold, 382 Livonia, Brooklyn, New York.

NIAGARA, Tarnish proof loose-leaf sections for U. S. regular and commemorative stamps. Your inquiry solicited. Commemorative section for 1937 singles and blocks 24c. Frank W. Jeffs, Box 234-P, Lockport, N. Y.

WANTED You to know that many foreign governments will sell mint stamps by mail. Some over fifteen years old. Many cost a fraction of a cent. Information, procedure and address of more than 150 governments for \$1.50. Rosebraugh, Lyons, N. J.

U. S. Introductory special, 50 different commemoratives, early or agency, souvenir sheet, two stampless covers, \$1.00. List. Omar Stamp Company, Hagerstown, Md.

ECUADOR'S U. S. Constitution issue. Six different mint 10c cents. Approvals. Nacado Stamp Co., Box 4229, Washington, D. C.

PRESIDENT Roosevelt souvenir sheet and packet of Constitution stamps, only 75c. Approvals included. Larry Hendry, York, Penna.

FREE! Book and stamps, "The ABC of Stamp Collecting," 48 pages of excellent information for beginners, advanced collectors, plus Tannou Touva diamond coronations, Edwards, others. Sent honest approval applicants sending 4 1/2c postage. Mortimer Ellis, 2841 West 37th St., Brooklyn, N. Y.

TIGER, Camel, other animal stamps, pyramids, ships, pictorials, British, French colonials, including big packet 61 different from Eritrea, Egypt, Togo, Africa, Asia, etc. 6c with approvals. American Stamp Company, Dept. 10, Frankfort, Ohio.



**FREE!** "American Packet"—bargain approvals. Augustus Loring, Winona Street, Brockton, Massachusetts.

**DAZZLING Offer!** Two diamond stamps 5c. Barcus, 1631 S. Lincoln, Denver, Colo.

**SELECTED Penny approvals.** Leader Stamp Co., 1550 Seward, Detroit, Mich.

**MAGNIFICENT Tannou Touva diamond,** unusual upside down triangle. Costa Rica triangle, Liberia triangle, Costa Rica diamond, Canalzone, Congo, jubilee, coronation, Edward, Palestine, West Indies, Manchukuo, South Seas, Mozambique, colonial pictorials, etc. Only 5c. Davidson, 2297 E. Salt Lake City, Utah.

**MIDGET Mixture—100 foreign stamps**—Asia, Egypt, Europe, etc., 5c. Elsea, Bowling Green, Ohio.

**VALUE Extraordinary!** 100 different U. S. stamps. Total catalog value over \$3.00. Nice clean copies, none damaged. 55c postpaid. A Grove, 306 Blanchard, Seattle, Washington.

**FREE.** U. S. \$1, \$2, \$4 and \$5 stamps. Unbeatable U. S. approvals. Nelson, 78 E. 5th St., St. Paul, Minn.

**FREE.** Prodigious packet diamond shaped airmail, coronations, animals, ships, etc., providing your minimum purchase over 25c from approvals. Progress Stamps, Kirkland, Washington.

**1000 DANDY Mixed stamps 25c.** Monjar, 1542 Waverly, Cincinnati, Ohio.

**FREE—The Stamp Finder!** Our new 24 page edition, fully illustrated, which will enable you to instantly identify all difficult stamps. Also fine packet of odd and unusual stamps from Bosnia-Herzegovina, Monaco, Patiala, Cyprus, etc., including maps, ships, animals and strange scenes. All free to approval applicants inclosing 3c postage. Garcelon Stamp Co., Box 900, Calais, Maine.

**U. S., Canada, Newfoundland, Mexico:** 300 mixed only 10c (50 different guaranteed) to applicants for "Four Star approvals." Kessels, Tucson, Arizona.

**40000 VARIETIES** First quality stamps available on approvals 1/2c up. Suitable selection on request, adults only. Keigwin Stamp Co., Vineland, N. J.

**\$5 U. S. Postage, fifty foreign,** with approvals 3c. Astor Stamp Co., 42 Astor, Jersey City.

**51 DIFFERENT United States, cat. \$1.60.** Airm. commemoratives and \$5 or 51 different Canada 18c with approvals. Jones, Box 146, Norristown, Penna.

**SWITZERLAND'S Automobile postoffice stamp.** This rare beauty and 50 other fine stamps sent approval applicants for 5c. Kumlir, King, Lancaster, Ohio.

**PENNY Approvals with premiums.** Bargains! Clark, 3024 Lakeview, Dayton, Ohio.

**500 MIXED** Containing 50 different U. S. 10c Approvals. Paul Baringer, Defiance, Ohio.

**FIVE 1931 Chile airmails plus 50 different Belgian** to approval applicants for sending dime. Gary Stamps, Box 403, Garrettsville, Ohio.

**ATTRACTIVE Canada or Swedish packet** free with approvals. Petersen, Box 300, St. Paul, Minn.

**SPECIAL 25 Different stamps,** including Spanish, Christopher Columbus issue for 5c to approval applicants only. Gardner Stamp Company, D4, P.O. Box 3720, Chicago, Ill.

**LIMITED Offer:** Latest Ecuador airmail constitutions, 3 varieties 5c. (Approvals.) Widgren, 1361 Addison Street, Chicago.

**UNITED States Constitution honored by gorgeous commemoratives!** Brazil 6c; France 10c; Honduras 40c; Guatemala sheet portraying Roosevelt! 65c to approval applicants. Frederick Day, 3938 Broadway, Indianapolis, Indiana.

**6 ECUADOR 1938 Constitution comms.** 7c with approvals. Co-operative, 130 Bates Ave., St. Paul, Minn.

**MEMBERSHIP 10c.** Dime Stamp Club. Exchange correspondence. Box 5287, Philadelphia.

**PANAMA Canal Zone:** 40 diff. \$1.00; 60, \$2.00; including Olympics, Bomberos, recent surcharges. Panazone Stampco, No. 1,000, Balboa, C.Z.

**DIAMOND Shaped air mail—Big packet** 105 all different, including air mail, commemoratives, Congo, Epirus, Manchukuo, etc.; set of two ex-King Edwards and Costa Rica diamond shaped air mail; scarce U. S. telegraph, cat. 30c; pkt. British Colonies—Gwalior, Hyderabad, Silver Jubilee; big lists. Everything for 5c to approval applicants. Send today! Mystic Stamp Co., Dept. 80, Camden, New York.

**15 AIRMAILS 7c.** U. S. airmail approvals. George Davis, Webster, Mass.

**60 DIFFERENT Countries in packet, 10c.** Ralph Tanner, Red Creek, N. Y.

**EXTRAORDINARY!** Free collection! Azerbaijan, Tanganyika, Belgian Congo, including approvals, Rosenberg, 3544 12th Place, Chicago.

**KING Edward and coronation stamps** are the best and most popular stamps this year and will prove to be immensely valuable. Set of 3 King Edwards, 2 coronations, Queen Victoria stamps over 56 years old, beautiful submarine telephone stamp and South Australia commemorative. All for only 5c to serious approval applicants. Potomac Stamp Co., Dept. 104-B, Washington, D. C.

**U. S. Mission mixture, 40c pound.** Stamps, Box 54, Racine, Wis.

**300 DIFFERENT 20c; 500, 35c; 1000, 90c.** Spears, 934 Blake Ave., Brooklyn, New York.

**OPPORTUNITY!** Triangles and diamond shaped stamps, United States commemoratives, Latin Americans including airmail, scarce Eritrea, Lebanon and multitude other different stamps. Everything 10c to approval applicants. Towson Shop, Towson, Md.

**MALAY Tigers, cranes, maps, birds in fine packet 65 diff. 10c with approvals.** Niagara Stamps, Stamford, Ont., Canada.

**1/5 CATALOG Approvals,** no German, sent with 250 different; or 150 (no German) choose—10c postage. Hooper, Lomita, California.

**SAMPLE Dozen printed to order stationery 25c.** Steocan, 2038 Obear, St. Louis.

**TRY My approvals 1/2c each.** Olivo Alvos, Box 132, Guadalupe, Calif.

**NEW Irish souvenir stamps.** A set of beautiful and interesting souvenir stamps has been issued by Irish Hospitals' Trust Ltd. A specimen sheet of 24 of these stamps may be obtained free of charge on applying to Dept. P.M. Mr. J. O'Sheehan, 28 Earlsfort Terrace, Dublin, Ireland.

**500 MIXED Foreign 10c.** Approvals included. Hecht Co., Belle Plaine, Iowa.

**FREE! Two coronation sets.** Postage 3c. Roberts, 312P Shearerbig, Bay City, Mich.

**GIANT-SIZED Russian zeppelin stamp,** cat. val. 20c, and beautiful Lithuania air mail triangle; also big packet of 53 different stamps including Azerbaijan, Epirus, new Martinique, etc., and illustrated lists, all for 5c to approval applicants! World-Wide Stamp Co., Box 600, Camden, New York.

**FREE.** Beautiful loose-leaf album to approval customers. Freeman, Tobey Road, Belmont, Mass.

**UNPICKED! 100 U. S. revenues on documents, 10c! 1,000, 60c.** Vanvoorhis, Hyndman, Pennsylvania.

**FREE 100 Different stamps** to approval applicants, 3c postage. Evanston Stamp Shop, Box 200, Evanston, Ill.

**UNITED States—45 different, perforation gauge, hinges, bargain pricelist—all for 10c.** Seidenberg, Baroda, Mich.

**FREE—Eight beautiful airmails including triangle,** to approval applicants enclosing postage. Green and Company, Norwood, Ohio.

**DIAMOND-SHAPED Stamp,** Liberia gunboat triangle, two other triangles, silver jubilee, 27 others, 5c. Crowder Co., 127E North, Baltimore, Md.

**U. S. Approvals that please.** Valuable premiums included. Dealing, Mound, Minnesota.

**FREE.** 25 Different South Americans to approval applicants. Harlan, 5307 S. Marshfield, Chicago.

**LIBERIA Snake triangle, giant Spanish triangle; 50 other stamps, 5c.** Wright Co., 2527 Guilford, Baltimore, Md.

**4 1/2 TRIANGLES!** Guatemala bisect (diagonal half-stamp), beautiful Liberia, three additional triangles, 27 other stamps, 5c. Abell Co., 1613 St. Paul, Baltimore, Md.

**100 DIFFERENT Hungary 7c approvals.** Hazett Stamp Shop, 701P Fourth, Baycity, Mich.

**CANNON!** Set of stamps showing cannon, firing squad, cavalry charge and 200 other different stamps, only 10c to approval applicants. L. H. Reich Stamp Co., 4225 Broadway, Chicago.

**1000 HINGES** With nice approvals, 10c. Harvey Teeple, Decatur, Ind.

**ILLUSTRATED U. S. list,** price 50c, large complete U. S. price list free. Send postage. Stanley Gibbons, 38P Park Row, N. Y.

**PENNY Approvals that please.** Haywood, 395 Adams St., Pomona, Calif.

**FREE! Triangle airmail! Coronation! Pictorials! British Colonies! Wonderful packet 110 different, 5c to approval applicants.** Bargain Co., Box 39P, Times Square Station, New York.

**SUPER-WONDER Packet offered,** containing 60 different stamps from Afghanistan, Transjordan, North Borneo, Manchukuo, Sudan, Guadeloupe, Iraq, Sarawak, French and British Colonies, including natives, beasts, ships, etc., all for only 5c to approval applicants. Big illustrated lists free. Kent Stamp Company, Box 87 (9), Brooklyn, N. Y.

**PANAMA Triangle and 50 others free** to approval applicants sending 3c postage. Tatham Stampco, Springfield-30, Mass.

**FREE! "United States and British North America"—our valuable, complete, illustrated, 64-page catalog** quoting lowest prices. Big illustrated list of foreign stamps also included. H. E. Harris & Co., 137 Transit Building, Boston, Mass.

**300 DIFFERENT Stamps 20c; 600, 50c; 1000, \$1; 2000, \$3; 3000, \$7.** Fred Onken, 630 79th St., Brooklyn, N. Y.

**QUEEREST Stamps packet.** Receive one of world's smallest stamps; scarce Vatican City; Greek Red Cross (coiled snake in Garden of Eden!); Manchukuo; Seruth (mountain lion); Mozambique (giraffe); Palestine; many others. Also big packet 25 diff. Japan, (including earthquake stamp!) and pkt. 15 diff. China. Everything for only 5c to approval applicants! R. M. Stamp Co., Box 250P, Port Chester, N. Y.

**50 DIFFERENT, Fine U. S. including perforation gauge, 10c with approvals.** The Stamp Shop, 809 Holland Bldg., St. Louis, Mo.

**25 DIFFERENT South American 10c.** No approvals. Burkhart Stamps, Sandwich, Ill.

**200 DIFFERENT 10c.** Big 50% approvals. Covert Stamp, 39 State, Rochester, N. Y.

**NEWFOUNDLAND, 15 Different 5c** with approvals. Frederick Brown, Plainfield, N. J.

**FREE! 110 Different stamps** to approval applicants. 3c postage. Zephyr, 5124 George, Chicago.

**FREE—\$2 And 15 other U. S. Foreign approvals.** Postage 3c. Wm. Clatworthy, Upland, Calif.

**STAMPS.** A superb selection sent on approval. Quality at low prices. Fred Herzberg, Box 91-P, Elmhurst, Ill.

**50 DIFFERENT British Empire** including jubilee, Edwards, 50 different new, recent and pictorial world issues. 15 different airmails, 500 hinges, perforation gauge, all for 25c. Approvals sent. Lists free. Victoria Stamp Co., London, 4, Canada.

**BRAZIL, 50 Different 10c** with bargain approvals. Davis, Silver Lake, Ind.

**ASK For our wonderful one cent approvals.** Prospect Stamp Co., 225 Broadview, Toronto, Canada.

**WHOLESALE Catalog for dealers.** Illustrated. Postage 5c. Frank Co., 4900 Chalmers, Baltimore, Md.

**PENNY Approvals, that satisfy.** Nell Gronberg, Box 5441-P, Philadelphia, Penna.

**WEEKLY Stamp magazine,** thirteen weeks, 10c. Stamp Journal, Kalamazoo, Mich.

**30 DIFFERENT Angola, Cape Verde, Guinea, Portugal, Mozambique, St. Thomas and Prince 5c.** Approvals. Depraw, Ocean Park, Calif.

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**APPROVAL Sheets.** One to three cents. Frederick B. Driver, 2009 Finance Bldg., Philadelphia, Penna.

**STAMP Dealers,** your ad here will bring wonderful returns. Ask me for proof. P. W. Johnson, Manager, Classified Advertising, Popular Mechanics Magazine, 200 E. Ontario St., Chicago.

**25 UNITED States, including \$4 and \$5 stamps** free to approval applicants, 3c postage. Brownie Stamp Shop, Flint, Mich.

**REDUCED—1c Daily,** establishes permanent mail address. Co-operative Mail Service, 126S Lexington Avenue, New York.

#### HOBBIES AND COLLECTIONS

**JUST Published—1938 directory of hobbies and spare-time opportunities.** A guide for amateur and professional hobbyists. 25c per copy. Park City Book Supply, Dept. 5, 1075 Pembroke Street, Bridgeport, Connecticut.



**HOBBIES.** Sports, recreation, etc. Exchange ideas with other hobbyists, whose interests are similar. Details—send 10c coin for handling charge. American Hobby Bureau, 234 Drexel Bldg., Philadelphia, Penna.

**FREE** Samples cellophane envelopes for stamps, coins, covers, photographs. Wetzel, Box 235, North Bergen, N. J.

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**DEVELOP** And print your own pictures. Save time, money with our complete outfit, \$1.95 plus postage, or sent C.O.D. Includes electric ruby lamp, printing frame, photo paper, chemicals and equipment. One of hundreds of amazing bargains in our free, newest, money-saving bargain book. Send for it today! Central Camera Co., 230 So. Wabash, Dept. 25-K, Chicago.

**ROLLS** Developed, 8 prints in Velox, 25c. 5x7 enlargement in handsome easel mount, 49c; 3 for \$1.35. Photoshop, Box 218, Augusta, Ga.

**PHOTO MILL.** Immediate service! No delay! Roll developed, carefully printed and choice of two beautiful 5x7 double weight professional enlargements, one tinted enlargement, or eight reprints—for 25c coin. Reprints 2c each. The Photo Mill, Box 629-12, Minneapolis, Minnesota.

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**AMAZINGLY** Beautiful, roll developed, 8 Natural Color prints, 25c. Reprints, 3c. Natural Color Photo, D-54, Janesville, Wis.

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**GUARANTEED.** Film developed, 16 prints 25c. 20 prints 25c. Quality Photo, Hutchinson, Kansas.

**SNAPSHOTS** Expertly colored 10c. Price list free. Mumber's Color Service, 5410 Wellington, Chicago.

**FILMS** Developed 2 prints of each 25c; 20 reprints 25c. Pine Photo, M-5134 Nevada, Chicago.

**QUALITY** Not quantity! Roll developed, 1c; prints, 3c each. Economy Photo, Box 157-P, Greensburg, Penna.

**FILMS** Developed—8 glossy, Neverfade, Perfotone, Velox prints 25c. Satisfaction guaranteed. Lookout Studio, Fort Payne, Alabama.

**BE** Convinced—Globe photos are unexcelled. 8 Duo-Tone prints, 2 5x7 enlargements. Send next roll 25c coin to Globe Photo Shop, La Crosse, Wis.

**RECOGNIZED** As a leader for high quality and better service. Do not be misled. It is easy to copy a name but hard to meet our superior quality. Roll developed, 8 guaranteed glistening prints and 2 enlargements 25c. The old reliable American Photo Service, 2946M Nicollet, Minneapolis, Minn.

**20 REPRINTS** 25c. Films developed, 16 prints 25c. Enlargements 8x10, 35c; 5x7, 10c. Low Photo, M-2857 Neva, Chicago.

**ROLL** Developed and printed. Two enlargements, one of them in colors, all for 25c coin. The Photo Finisher, Station E, Box 42, Columbus, Ohio.

**PROFESSIONAL** Quality service. Rolls developed, 8 prints and 2 enlargements 25c. The Film Capital Service, Box 504, Rochester, N. Y.

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**PROMPT** Service, guaranteed work. Two beautiful portrait type double weight enlargements, eight neverfade gloss prints, each roll 25c. Dubuque Film Service, Dubuque, Iowa.

**DEVELOPING.** Printing, enlarging for the discriminating. Any roll developed and printed. Eight prints 25c roll. (127 to 122 eight exposures) developed and 5x7 enlargements of each negative 50c. Knickerbocker Photo Co., 129 West 27th Street, New York City.

**MAKE** Money in spare time with your camera. See adv. Cameras and Supplies column. Cooperative Photographers.

**ROLL** Developed and 8 guaranteed prints including two enlargements, 25c coin. Super Snapshot, Winona, Minnesota.

**ROLL** Film developed and one print each in individual album 25 cents coin. High class work, fast service. King's Photo, Box 447, Rockford, Illinois.

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**LATEST** in photo finishing. Miniature rolls developed and printed 3x4—5c each print. Radio Film, LaCrosse, Wisconsin.

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**BE** Modern! Get Modern service. Modern quality. Modern prices. Our modern methods give quick service and bright guaranteed neverfade pictures. Roll developed 16 prints, 25c coin. 16 reprints, 25c. Enlargement coupon. Send next roll or reprint order to Modern Finishers, 3537-C, St. Paul, Minn.

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**ADDED Income ideas.** Mail Sales News magazine, copy 10c. Katz, 4254 No. Kimball, Chicago.

**WHERE To buy at lowest wholesale** prices. Information free. Yorena, Box P-312, Bayonne, N. J.

**PLASTEX Industries** offers industrious men an opportunity to start a business of their own, manufacturing art goods, novelties, souvenirs, etc., in Plastex and marble imitation. 5c material makes \$1 articles. Rubber moulds furnished for speed production. Small investment brings big returns. You are just in time for the big 1938 season now starting. Write for interesting booklet mailed free. Plastex Industries, Dept. A, 1085 Washington Ave., New York.

**MANUFACTURE From Phospholene.** Cleaning fluid 1c gallon; bleach 2c gallon; and ten fast sellers. Sample 25c. Details free. Western, 6615 Denison Ave., Cleveland, Ohio.

**DONUT, Potato chip, cheese** pop corn. Home made. Big profits. Vanderpol, Springfield, Ohio.

**WE Start you in business,** furnishing outfit and instructions, operating Specialty Candy Factory home. Men and women, earn \$25 up to \$60 weekly, all or spare time. (Our 29th year.) Booklet free. W. Hillyer Ragsdale, Inc., Drawer 4, East Orange, N. J.



**OPERATE** Chain world's finest money making vending machines. Sells four products, same time. Instant success! Small capital, profits immediately. Penny King, 1233 Chouteau, St. Louis.

**SUCCEED** With your products. Make-sell them. Formulas. Processes. Accurate analyses. Catalog free. B. Thaxly Co., Washington, D. C.

**PROFITABLE** Home business. Legitimate. No canvassing. Maywood Publishers, P-923 Broadway, New York.

**SELL** By mail. Books, novelties. Bargains! Big profits! Particulars free. E. Elftco, 438 N. Wells, Chicago.

**FREE** Booklet describes 107 plans for making \$20-\$100 weekly, in home or office, business of your own. Elite Co., 214 Grand St., New York.

**I WANT** To send you proof of the wonderful pulling power of Popular Mechanics Magazine's classified pages. What's your proposition? Write me today. P. W. Johnson, Manager Classified Advertising, 200 E. Ontario St., Chicago, Ill.

**CHARTERS:** Delaware; best, cheapest; free forms. Colonial Charter Co., Wilmington, Del.

**CASH** Every week clipping and preparing news items for publishers. Simple, fascinating work. Experience unnecessary. Stamp brings information. Division 55, National Press, 3923 W. Sixth, Los Angeles, Calif.

**DELAWARE** Charters: Complete service \$35. Submitted forms. Chas. G. Guyer, Inc., Wilmington, Del.

**ARTIFICIAL** Marble sanitary flooring, instruction covering wood or cement flooring 1/2 inch thick, fireproof, all colors, low cost, ornamental casting, concrete, plaster, papier-mache, garden furniture, statuary, flexible molds, particulars free. Chris Mahler, Elmont, N. Y.

**MAIL** Order business is your opportunity. Many began small, now earn thousands yearly. No personal contact. Boundless opportunities. Have had over 30 years experience; will help you succeed. Send 25c for valuable booklets, none free. B. Brenner, 257 S. 21st, Philadelphia.

**100 PROFITABLE** Mail order and local plans. Gilbert Supply, 1107 Broadway, New York.

**YOU'LL** Like resilvering mirrors, auto-parts, reflectors, making chipped glass signs. Write, Sprinkle, Plater, 127, Marion, Indiana.

### MONEYMAKING OPPORTUNITIES

**MERCHANTS.** Proven sales-plans worth weight in gold! Satisfaction guaranteed! Send \$1.00 for three. W. S. Finigan, Oneonta, N. Y.

**EASY** Money formula for making best penetrating oil on the market. 300% profit. Big repeater. Directions for making and selling 50c. W. A. Farnsworth, 301 West Main St., Bellevue, Ohio.

**MONEY** Making propositions, practical and legitimate. Free particulars, Schembri, P.O. Box 1271, Detroit, Mich.

**"SPARETIME** Roads to Riches," explains hundreds new easy moneymaking opportunities, 10c. Lewis Co., 329-M Carpenter, Oak Park, Illinois.

**TAKE** In the dollars with the "Money by Mail" system. Particulars free. Key Systems, Box 323, Jeannette, Penna.

**FREE** Circulars describing moneymaking mail order and local business plans. Robert McGuire, Johnson City, Tenn.

**ALL** Kinds, forty pages, three, 10c. Home Industries, Benson, Nebr.

**WANT** Money? Send your address. Enclose stamp. Stefflee, 5505 Murray, Mariemont, Ohio.

**KEROSENE** Or electric lamps made out of fruit jars with Century Lamp Jar Caps. Send 25c for sample and money making proposition. Century Home Appliances, St. Paul, Minn.

**453 AMAZING** Moneymaking exposures. Dollar gift, free plan. 33c stamps. King, Ahwahnee, Calif.

**PAYING** Mail order business, your own. Write Dixie Mailers, King, N. Carolina.

**HOMEWORK** Opportunities Magazine—10c. Sample 5c. Schumacher, 3503 Hirsch, Chicago.

**1,000,000** ARTICLES Wholesale. Directory 10c. Jelsmith, 163 Myrtle, Waltham, Mass.

**TURN** Spare time into cash with typewriter! Addressing envelopes, mailing circulars, typing! Dime brings information, none free. Ace-PMC, 322 Empire, Birmingham, Ala.

**"NEWEST** Mail proposition"! Different! Safe! Profitable! Food concentrates, vitamins, endocrines. "5000 word folio." Samples, dime. Gardena Institute, 128P, Station "S," Los Angeles.

**MONEY** In butterflies, moths. See Sinclair Display Advertisement on page 14A.

**WINNING** Plans that click. One year 50c. Winner, 1433 Tenth, Charleston, Ill.

**MONEY,** Easy, Legitimate. No canvassing. Satisfaction assured. Goode, Paragould, Arkansas.

**CASH** In, 300 tested moneymakers. 64 page book, over 40,000 words. 10c postpaid. Business secrets, formulas, wholesale supply sources galore, no ads, meat only. Moneyback is dissatisfied. National Plans Institute, 246M Fifth Ave., New York.

**"\$35 WEEKLY** For 3 hours homework." 204 other moneymaking plans. Particulars free. Stamford, 836-P Riverside Drive, New York.

**FORMULAS,** Odorless clothes bleach and other new fast profitable sellers easily manufactured in home. Bon-A-Ben, 1008-D So. 64th, Milwaukee, Wis.

**EARN** Money collecting reptiles, toads, frogs for us. For particulars send dime. Biological Research Laboratories, Dept. 14, Springfield, Missouri.

**COPY** National Mail Order News 10c. Box 1773PM6, Roanoke, Virginia.

**SEE** Sensational animal creation. Direct from owner. Earn living by mail. Sample and particulars 25c coin. None free. P. O. Box 151, Dallas, Penna.

**CASH** For clippings! Prepare clippings for publishers. Simple plan has proven profitable. Free details. American Press Bureau, B-1026, San Jose, Calif.

**FASTEST,** Biggest, easiest money-making plan. Free particulars. Rucla, Box 292, Albany, N. Y.

**EARN** Money sparetime. Tested plan gets dimes. Complete plan, \$1.00. National Specialties Guide, West Branch P. O. 486, Los Angeles, Calif.

**SWAP & Sell** magazine, "The Nation's Market Place." Get the things you want without paying for them. Magazine prints your ads free. Sample copy 10c. Swap & Sell, 99M Hudson Street, New York City.

**NOW** Make money! A \$1.00 magazine (40th year), filled with schemes, tips, business opportunities, formulas, sent six months for only 30c. "Schemer Monthly," Alliance, Ohio.

**HOW** And where to obtain capital fully explained, free particulars. Star Service, Wapakoneta, Ohio.

**GET** Dollar bills in your mail daily. Nearly all profit. Particulars free. Homecraft Arts, Lakeside, Calif.

**SELL** By mail; big profits; free literature. Hunt Products, 49 Edgemere, Trenton, N. J.

**STOP** Squealing—Start crowing! Work mornings home—country drives or movies—afternoons! No canvassing! Folio-A, Station "D," Los Angeles.

**MILLIONS** Jobless! Get dollars in mail daily, like we do, for amazing employment information. Keep money! We fill your orders free. Stamp brings details. Co-Operative Service, 77 Swan, Buffalo, N. Y.

**AUTHENTIC** Prosperity plans bring \$8.75 daily. Start on \$1.25. Literature free. Direct mail. Box 344, Summit, New Jersey.

**PROFIT** In vegetables, flowers, using chemicals. Remarkable yields. Proven formulas. Chemicals for 48 gallons solution. Instructions \$1.00 postpaid. Quick Growth, Hollywood Sta., Box 648, California.

**START** Mailorder business. Details free. Pederson, 1609 1/2 East Fifth, Duluth, Minn.

**MAN** In each town to plate auto parts, reflectors, bicycles, fixtures, mirrors, by late method. Simple plan of manufacturing at home starts you in good paying business. Free particulars and proofs. Gunmetal Co., Ave. N, Decatur, Ill.

**RAISE** Earthworms for profit. Information free, stamp appreciated. Bureau Zoological Research, 100A Broadway, Peoria, Ill.

**MOULDS,** Guaranteed, for casting toy soldiers, Indians, trappers, warships, sinker moulds, 244 kinds. Send 5c for illustrated catalogue. Henry C. Schiercke, 645 Spencer, Ghent, N. Y.

**107 PLANS** For making \$20-\$100 weekly in home or office business of your own. Descriptive booklet free. Elite Co., 214 Grand St., New York.

**WHOLESALE** Sources, 500,000 articles. Free directory. Maywoode, 925 Broadway, New York.

**LIKE** To draw? Earn steady income tracing and duplicating advertising cartoons. Ad-Service, Argyle, Wis.

**YOU'LL** Like resilvering mirrors, auto-parts, reflectors, making chipped glass signs. Write, Sprinkle, Plater, 287, Marion, Indiana.

### FORMULAS, PLANS, ETC.

**BRUSHLESS** Shaving cream. Latest scientific manufacturer's formula \$1.00. Send 25c coin for sample. Geo. Twidle, 502 - 15th Ave., Belmar, New Jersey.

**GROW** Without soil—Flowers, vegetables, plants. Year round, anywhere. Only water and common chemicals used. Formula \$1.00. Bestovall, 4047-W North Whipple St., Chicago.

**MAKE** Bleach water. Formula 50c. Capotosto, 1707 Cranston St., Cranston, R. I.

**NEW** Mechanics soap, guaranteed remove grease, formula 25c coin. Modern Labs, Box 53, Schuylerville, New York.

**GUARANTEED** Formulas—New fast sellers. None better. Lowest prices. Catalog free. Kemico, 49W, Park Ridge, Ill.

**ANY** Formula 30c or money back. Catalog free. Ogg Laboratories, Tampa, Fla.

**EIGHTEEN** Money making automobile specialty formulas including the celebrated Petrolube gas saving formula with complete plan for selling by mail. All for only 63 cents. Bucknam, 177 State Street, Boston, Mass.

**ANY** Ten formulas, guaranteed best, 25c coin. Press Service, Station G, Buffalo, N. Y.

**KAR-O-MEL.** Ten other popcorn formulas, including cheese, directions, etc. \$1.00. Dietz, Toledo, Ohio.

**OUR** Formulas are money makers. Trade secrets, special formulas. Catalog free. Industrial Laboratories, 1200 Niagara, Buffalo, N. Y.

**BRUSHLESS** Falseteeth cleaner 15c. Makes 1 gallon. Formula \$1.00. Walsh, 248 Whittenton St., Taunton, Mass.

**ANALYSIS.** Research. Newest guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson Laboratory, Chemists, BD-1142 Sunnyside, Chicago.

**SOILLESS** Plant culture. Raise tomatoes, potatoes, flowers, etc., in shallow tank of water containing 21 chemicals. Tomato vines 20 feet, bear for year, 20 pounds per vine, quality better than soil grown. Instructions, formula \$1.00. Purdy's Chemicals, 1852 E. Slauson Ave., Los Angeles.

**CHEMICAL** Analysis. Practical formulas. Ideas developed. Associated Chemists, Indianapolis, Indiana.

**10 PROVEN** Money-making formulas 50c coin. Broukins, Box 83, Stoneham, Mass.

**STAMP** Brings free instructions for making fastest selling, big profit products. No formulas needed. Concentrated Products, Dept. 1591, Tampa, Florida.

**MEN!** Shave without razor! Send 25c for formula for self-shaving soap. Carl Greiner, 5112 N. Oakley Ave., Chicago, Ill.

**FORMULAS!** Best produced for exceptional popular necessities. All lines. (Not stock-formula catalog stuff.) Get these unusual offers—stamp brings them. Miller, Manufacturers' Chemist, Tampa, Florida.

**100 MONEYMAKING** Formulas 25c. Descriptive literature free. Harvey Teeple, Decatur, Ind.

**THAXLY** Formulas for perfect products. Accurate analysis assured. Resultful research. Catalog free. B. Thaxly Co., Washington, D. C.

**FORMULAS.** Latest money makers. Literature free. Belfort, 4042 N. Keeler, Chicago.

### CHEMISTRY

**FIREWORKS.** Ten formulas 25c. Free chemical catalog. Meshna, Malden, Mass.

**CHEMICALS,** Laboratory glassware, apparatus. Send 3c for catalog CP1. Biological Supply Company, 1176 Mt. Hope Avenue, Rochester, N. Y.

**CHEMISTRY,** Biology, mineralogy supplies, microscopes, telescopes. Catalog free. Teeko, Evanston, Ill.

**HANDBOOK** For chemical experimenters, hundreds of experiments, illustrated, 50c. Experiment booklet, 15c. Chemical catalogue, 10c. Reading Scientific Co., Reading, Penna.



**FREE** Chemistry catalog. Supplies at 5¢! Equip complete laboratory. Send 3¢ for postage. Kemkit Scientific Corp., 397P Bridge St., Brooklyn, N. Y.

**ANALYSIS.** Research. Newest guaranteed formulas. Biggest catalog free. Special prices leads. Gibson Laboratory, Chemists, CT-1142 Sunnyside, Chicago.

### AGENTS WANTED

**PROFIT** By other men's "ups and downs." Wear and sell "Anchor Pads." Comfortably holds "shirt down—pants up," without pressure. Retail 25¢. Worth dollar for comfort and looks. New and desirable. Unit sales average 1 to 4 sets. Each set on flash display card. Sells on sight. Sales repeat. Profit harvest for spring and summer. Send 10¢ for sample set and particulars. J. V. Pilcher Mfg. Co., Louisville, Ky.

**AGENTS** Make bigger profits on food products—bargain deals. Low wholesale prices. Big display case sent on trial. Ho-Ro-Co, 2810-R Dodier St., St. Louis, Mo.

**450% PROFIT** Quick-Action automatic gas lighter. No flint. 25¢ seller to every home, office and restaurant. Sample 10¢. New Method Co., Box PMG-65, Bradford, Penna.

**100% PROFIT.** Sell water softeners. Sizes \$5.50 and up. Get free demonstration outfit offer. Master Inc., 5057 Queen South, Minneapolis, Minnesota.

**GIANT** Moth killer. Weighs 1½ lbs. Home and industrial use. Steady repeats. Sample 75¢ postpaid. Elkey Products Corp., 323 West 16th Street, New York.

**SALES** Agents. We offer exclusive territory to live wires for the fastest selling product in America. Every owner of table radio sets a buyer. Low priced, big profits. Write for particulars to Columbia Pad Co., 124 West 31st Street, New York City, N. Y.

**JUST** Out! Amazing fast selling 25¢ household necessity. Saves hundreds of dollars. Sell 3 to 4 each home. Make up to \$6 daily. Free sample. Puro, 3107 Pine, Dept. E-296, St. Louis, Mo.

**A BUSINESS** of your own, making Palmer's original chipped glass name plates, numbers, mirrors, signs. Illustrated literature and sample free. E. Palmer, 512, Wooster, Ohio.

**UP** To \$6.00 an hour. Amazing Karnu refinishes autos like new without rubbing, polishing, waxing or painting. Inexpensive—costs little. Wipes on with cloth. Lasts 8 to 12 months. Free sample. Karnu, Dept. E-8, Cincinnati, Ohio.

**NEW** Kind of heat boils water instantly. Make to \$30 daily. Pocket size minute demonstration. No installation. Free offer. No investment. Write the Lux Co., Dept. B-305, Elkhart, Indiana.

**500% PROFIT** Selling new 20-in-1 kitchen utensil. Retail 25¢. Costs you \$1 a dozen or \$6 a gross. Sample 10¢. New Method Co., PMM-65, Bradford, Penna.

**SELL** An old established line. 100% profit, make big money. Ampco, 32 Union St., Malden, Mass.

**AT** Home, your own manufacturing business, making popular \$1 novelties. Cost you 3¢ to 15¢. Everything supplied. Write So-Lo Works, Dept. E-842, Cincinnati, Ohio.

**AMAZING** Sharpener—100 shaves from same blade. 400% profit. \$1.00 sample 25¢. Dallas Ruth, Wheelersburg, Ohio.

**BIG** Money applying initials on automobiles. Write for particulars and free samples. American Letter Company, Dept. 40, Dunellen, New Jersey.

**100% PROFIT** In new perfected (1936) quick-action self-starting cigar lighter. No flint or friction. No wind can blow it out. Retail 25¢. Costs you \$1.75 dozen. Sample and can fluid 25¢. New Method Co., Box PM-65, Bradford, Penna.

**TAKE** Orders for genuine Indian mocassins for men, women and children. Edwards Factory, Jamaica Plain, Mass.

**NEW** Waterman product. Vis-O-Pen. One dollar seller. Remit for sample. Martin Company, Farmingdale, New York.

**MILLIONS** Of motorists need Reflectolite, a new auto accessory. Sample and confidential prices 50 cents. Apollo Mfg. Co., 319 Union, Memphis, Tenn.

**AGENTS**—Millions spent yearly by public on relief of colds, coughs, catarrh, bronchitis and sinus infection. Offering something new. 100% profit and steady repeater. Sample and particulars sent for 25¢. Jackson Inhalation Co., Box 1613, Jacksonville, Fla.

**AGENTS** Wanted. Razor blades. Big profit. Louis Eugene, 277 Broadway, New York.

**MAN** And wife—to run local coffee agency. Earnings up to \$240 in a month. New Ford sedan given you as bonus. I send complete outfit. You don't risk a penny. Details free. Albert Mills, 6223 Monmouth, Cincinnati, Ohio.

**MAGIC** Electric brush retails \$1.50—your profit 75¢. Uses static electricity. No wires, batteries or expense. Carry in your pocket, unbreakable. Send for sample and particulars. Donald Brush Co., Advertising Dept., Camden, N. J.

**SENSATIONAL** 99¢ Flavoring deals with 62¢ profit! Twenty-three flavors! Experience unnecessary! Glenwood Products Company, McLean, Virginia.

**NEW** 50¢ Stenographer—typist necessity, indispensable time-labor saver. Minute demonstration sells dozens. Hundreds prospects any large office building. Sample, particulars 10¢. Feedeasy Manifold Company, Box 731, Dallas, Texas.

**500% PROFIT.** JiffyHook curtain tie-back holder. New. Beautiful sample 6¢. Weldon, Mfr., Maryland Hts., Mo.

**STOP** Job hunting! Start own light manufacturing business. Millions need product! Supply your territory. Brand new! Tremendous profits! Particulars free! Thermo F-F Works, Peoria, Ill.

**MONEY** In butterflies, moths. See Sinclair Display Advertisement on page 14A.

**YEAR-ROUND** Best sellers. Huge profits! Samples, literature free! Specialties, 4931-N Hamlin, Chicago.

**HAN-DEE-CLOTHS** Quickly polish all metals. Rapid 25¢ seller. Gratifying profits. Ruskin Company, 1907 Rosemont, Cleveland.

**FREE** Typewriter. Outfit 25¢. Details free. Associated, Southside, Oil City, Pennsylvania.

**BOYS!** Girls! Easy to earn cash. Sell concentrated vanilla flavoring to neighbors. Send dime for full size package and details. General Products, 776R, Springfield, Mass.

**"\$35 WEEKLY** For 3 hours homework." 204 other moneymaking plans. Particulars free. Stamford, 836-F Riverside Drive, New York.

**REVOLUTIONARY** Window cleaning tool. Good Housekeeping approval. Only ten \$2.25 sales daily to housewives, factories, schools, stores will make you \$550.00 monthly. Carter Products Corp., 900 Front Ave., Cleveland, Ohio.

**GENUINE** Black calf leather belt. 138 separate pieces 89¢. Agents wanted. Jos. Reno, 1519 N. 27th St., Milwaukee, Wis.

**BUILD** Profitable business selling soaps, cleaners, polishes, waxes, deodorants. Every product guaranteed. Big profits. Buy direct from 50 years old manufacturer. Write immediately. Baum's Castorine, Rome, N. Y.

**NEON-LIKE** Signs. 8"x14" cost 3¢—retails 25¢. Over 1000 designs. Catalog and sample free. Lowy, Department 807, 8 West Broadway, New York.

**PROFIT** With new products. Make, sell, repeat. Analysis. Research. Guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson Laboratory, Chemists, BD-1142 Sunnyside, Chicago.

**SELL** Roof paint: good proposition. Flanagan Bros. Company, Youngstown, Ohio.

**STRETCH** Your dollar to three. Sell "Stick-Foam," the new waterless, bottleless shampoo. None finer. Retail 25¢. Guarantee 50¢ value. Costs you \$1.00 per dozen, postpaid. Three assorted odors. "Sunset," "Sweetbreeze," "Pinetar." A. P. Straub, Beatrice, Nebr.

**STARTLING** Invention—Pocket adding machine. Nationally advertised \$2.50. Whirlwind seller. Big profits. Calculator Mfg. Co., Box 1118, Chicago.

**WANTED**—District purchasing agents. No experience or money required. Write Purchasing Manager, 174 N. Halsted, Chicago.

**GIVEN**—Packard Lektro shaver. Make \$10 quick. Free sample card. Details. Golden Rule Co., Box 285, Altoona, Penna.

**200% PROFIT.** Noknot clothes line reel sells on sight at 25¢. Carl Clouser, 11 Glynn Terrace, Quincy, Mass.

**PRIVATE** Brand cosmetics and toilet preparations. We print your name on the labels. 200% to 400% profit. Send for complete details and prices. National Scientific Laboratories, 1910W Broad, Richmond, Va.

**EXCLUSIVE** Representatives appointed. Faucet water softener. Revolutionary. Luxosoft, Sausalito, California.

**MONOGRAMMING** Automobiles biggest money maker today. New type requiring no varnish to apply. Write for samples. International Monogram & Transfer Co., Box 9360, Philadelphia, Penna.

**SELL** Made to measure raincoats. Outfit free. Goodyear Rainwear, 106 E. 19th, New York.

**ATLAS** Windown sign letters. Large sizes, penny each. Beautiful free samples. Atlas, 7941 Halsted, Chicago.

**MEXICAN** Curios, tremendous money-makers. Samples 10¢. Marquez-P, Apartado 1176, Mexico City.

**BIG** Money applying initials on automobiles. Easiest thing today. Free samples. Also, sideline salesmen for name plates and tire cover transfers. "Ralco," 1305 Washington, Boston, Mass.

**300% PROFIT** Selling bankrupt bargain merchandise. Southerners, 164-M Henry, New York.

**BIG** Money taking orders: shirts, ties, hosiery, underwear, raincoats, pants, uniforms, etc. Sales equipment free! Experience unnecessary. Write Nimrod, Dept. 8, 4922-28 Lincoln, Chicago.

**500% PROFIT!** Gold and colored sign letters for windows, offices, trucks, signs. Auto monograms. Easily applied by agent or customer. Neonite, Akron, Ohio.

**AGENTS:** Smash go prices! Santos coffee 12¢ lb. 4 oz. vanilla 8½¢. Razor blades 10¢ for 8½¢. 100 sticks chewing gum 12¢. 150 other bargains. Premiums. Experience unnecessary. Carnation Co., PO, St. Louis, Mo.

**GUARANTEED** Gold leaf letters for store and office windows. 500% profit. Free samples. Metallic Co., 438-B N. Clark, Chicago.

**MAN** In each town to plate auto parts, reflectors, bicycles, fixtures, mirrors, by late method. Simple plan of manufacturing at home starts you in good paying business. Free particulars and proofs. Gunmetal Co., Ave. H. Decatur, Ill.

**AGENTS**—To mail our literature. Good profits. Home business. Maywood, 149 Fifth Ave., New York.

**SUCCESS** With your products. Make-sell them. Formulas. Processes. Accurate analyses. Catalog free. B. Thaxly Co., Washington, D. C.

**AGENTS**—Opportunity to make money; book containing 107 successful business plans; home or office; send for free introductory booklet. Elite Co., 214 Grand St., New York.

**FREE** Sample—Amazing cleaner; sells homes, taverns, everywhere. Big profit—fast repeater. Betco, 5007 Irving Park, Chicago.

**AGENTS:** Stamping names on pocket-key protectors. Sample check with your name, address, 25¢. Stamping outfits. Emblem checks, check-jobs, name plates. Hart Mfg. Co., 303 Degraw St., Brooklyn, N. Y.

**MANUFACTURE** Specialties, hire agents yourself. Big money. Free literature. Gilbert Supply, 1107-F Broadway, New York.

**ENGRAVED** Name plates, numbers, signs, etc., easily sold, profits large. Brett Bros., Winthrop, Mass.

**BUSINESS** Proposition: Resilvering mirrors, autoparts, reflectors, making chipped glass signs. Write, Sprinkle, Plater, 128 Marion, Indiana.

**150% PROFIT.** Supplement your present line with natural herb laxative. Dandy repeat item. Everyone uses laxatives. Write Desk 100, National Health Service, Orlando, Florida.

### HIGH-GRADE SALESMEN

**WANTED**—By tool manufacturer, three salesmen between 30 and 40 years of age. One for eastern states, one for southern states and one for Rocky Mountain states, to travel by automobile calling on hardware dealers, machinery dealers, manufacturing plants, automotive service trade, and schools. Our lathes have been on the market for 31 years and are nationally advertised. Want salesmen who have had some mechanical experience or technical training. State age, experience, education, etc. South Bend Lathe Works, South Bend, Indiana.

**EXPERIENCED** Salesman. Good commissions, exclusive territory, take orders finest year around line clothing for entire family. \$350 samples furnished; sweaters, underwear, snowsuits, mackinaws, etc. Car necessary. Patrick-Duluth, Duluth, Minn.



**SENSATIONAL!** Full size, sturdy, guaranteed adding machine, retails only \$9.95 complete. Also multiplies, divides, subtracts. Enormous demand among retailers, professional offices, factories, schools, insurance men, etc. Big commissions—\$100.00 weekly easy. Write, Addomatic, Dept. B-12, 430 N. Oakley, Chicago, Ill.

**SELL** America's most complete line of business necessities. Regular and novelty size book matches, gummed labels, political items, pricing sets, restaurant supplies, salesbooks, engraved like stationery, shipping room supplies, office supplies, printed gummed tape, advertising chewing gum, advertising pencils, thermometers, business stimulants, complete line standardized printed business forms and hundreds of other fast sellers. Business cards \$1.50 thousand. Stationery \$2.70 thousand. All competition undersold. Cash commissions advanced daily, plus extra bonus. Experience unnecessary. Brand new huge 1938 outfit free. Federal, AC-301 South Desplaines, Chicago.

**MYSTERY** Electric sign. Third dimension. Salesmen coin money showing to merchants everywhere. Get details today. Jones Brothers, Merchandise Mart, Chicago.

**DID** You make \$50 last week? Does your job offer you real future? If not, why not start a wholesale business of your own? Little or no capital needed. Handle line 200 nationally advertised 5c-10c products. Show merchants new plan for increasing sales and profits. Handle everything from your home at start. Chance to operate one of our Silver Fleet service trucks. Facts free. World's Products Co., Dept. 5810, Spencer, Ind.

**SALESMEN:** Sell business stationery, book matches, advertising gum tape, advertising pencils, shelf moulding, labels, salesbooks, pricing sets. Business cards \$1.50 thousand. 35% commission daily. Free deals. Sales portfolio free. David Lionel Press, 312 So. Hamilton, Dept. 2F, Chicago.

**SELL** Salesbooks, cafe checks, etc., as a sideline. Big commissions weekly. Write for handy kit. K. C. Salesbook Co., 1016-P Baltimore, Kansas City, Mo.

**GET** Own suits free as bonus. Make big profits. Show friends movie star styles in made-to-measure clothes at big savings. New fashions and fabrics, inspired by Buddy Rogers, Cesar Romero, other movie stars—\$15.95 up. Guaranteed to fit and satisfy. Big commission for you on every order. 100 large samples and big book movie star pictures and styles free. Jim Foster, Inc., 2250 So. Spaulding Ave., Dept. A-5, Chicago, Ill.

**SELL** Nothing. \$95.00 weekly. \$500.00 punchboard firm announces new, no investment plan. Season starting. K&S, Dept. C125, 6227 Broadway, Chicago.

**20,000 MILES** From weak, discarded tires with Tire Armor—A selling sensation! We deliver. Liberal commission. Motor Products, 1700 Lunt, Chicago.

**SPARKLING** Glo-Brite signs sell fast to stores, restaurants, taverns. Lasting gold finish. Religious mottoes. J. A. Baxter, Cambridge, Ohio.

**DON'T** Be a job hunter—Start your own business on our capital. No hard times; no lay-offs; always your own boss. Hundreds average \$3,000 to \$5,000 annual sales year after year. Sales way up this year. We supply stocks, equipment on credit. 300 home necessities. Selling experience unnecessary. Wonderful opportunity to own pleasant, dignified, profitable business backed by world-wide industry. Write Rawleigh's, Dept. E-U-PPM, Freeport, Ill.

**BLADES.** Factory prices. Free delivery. Ace Blades, Dept. 5-C, Rochester, N. Y.

**SELL** Grooved felt back changeable signs with double prong celluloid letters to all stores. Big commissions. P. Pricing Press, 124 White St., New York.

**BRUSH** Salesman—if you ever sold brushes write for our money making proposition. Donald Brush Co., Camden, N. J.

**SALESMAN** Wanted, \$250 weekly profits made selling special tool set to garages. No competition. Write Mesco, Box 205P, Beaver City, Nebr.

**ADVERTISING** Book match factory offers you amazing opportunity. We are largest in world selling direct. Big cash commissions. Full-part time. Big repeats. Samples and kit free. Match Corp. of America, Dept. E-5, 6041 Grand, Chicago.

**IMMEDIATE** Opening selling advertising matches to taverns, cafes, beauty shops, politicians, etc. Cash commission. Outfit free. Gem Match, 74 West Washington, Dept. 35, Chicago.

**NEW Specialty.** Sells every business. Forced demand. Large earnings. Rimer Company, Silver Springs, N. Y.

**"35 WEEKLY** For 3 hours homework." 204 other moneymaking plans. Particulars free. Stamford, \$36-F Riverside Drive, New York.

**FORTUNES.** Selling Gro-All, grows larger flowers, vegetables, without soil. Retails 50c. Exclusive territory. Wisconsin Growers, 2509 N. 3rd, Milwaukee, Wis.

**SALESMEN.** Amazing magnetic brush. Pocket size. Money maker. Creates static electric suction. Exceeds vacuum cleaner. Neway Brush Company, Hartford, Conn.

**A SURE** Cure for clogged drains. This tool sells on sight. Get a city and become independent. Silent Valve Co., 3420 Fletcher Drive, Eagle Rock, Calif.

**SALESMEN:** Sell advertising novelties, calendars, fans, thermometers, etc., for nationally known firm. Liberal commissions. Stanwood Hillson Corp., 21 Station St., Brookline, Mass.

**BIG** Money taking orders; shirts, ties, hosiery, underwear, raincoats, pants, uniforms, etc. Sales equipment free! Experience unnecessary. Write Nimrod, Dept. 65, 4922-28 Lincoln, Chicago.

**EXECUTIVE** Past forty interview church societies. Ramo, Brighton, Rochester, N. Y.

**WANTED,** Monumental salesman everywhere. Marble-Granite Company, A-17, Oneco, Fla.

**ATLAS** Window sign letters. Large sizes. Penny each. Beautiful free samples. Atlas, 7941 Halsted, Chicago.

**OUR** New 1938 complete line of brushes now ready. Largest commissions. Write for sales plan. Wire Grip Sanitary Brush Company, 2300 5th Ave., New York.

**NEW Specialty—Sells** every business and professional man. Four \$15 sales daily pay \$280 weekly. Farrell cleared over \$1,000.00 monthly. Write, P. E. Armstrong, President, Dept. PM, Mobile, Ala.

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**MAN** Wanted—by shoe manufacturer established 35 years, for sales work. Ready cash daily. No experience needed. Your own shoes at factory prices. Complete line of almost 300 styles for men and women, including famous Velvet-Eez air cushion nailless insole shoes, sent free. Write Mason Shoe Manufacturing Company, Dept. R34, Chippewa Falls, Wisconsin.

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**STOP** Job-hunting. Be your own boss. Start profitable mail order business of your own. No selling. Write Hant Service, 516-A Federal, Pittsburgh, Penna.

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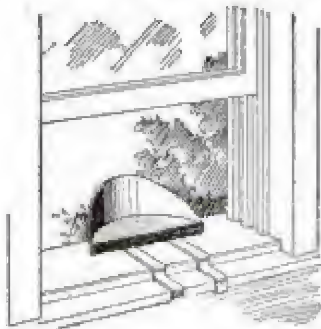
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## NEW INVENTIONS

(Continued from page 37A)

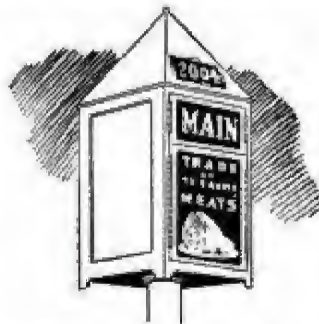
**M**EETING that need for an extra seat in small home or apartment is a de-



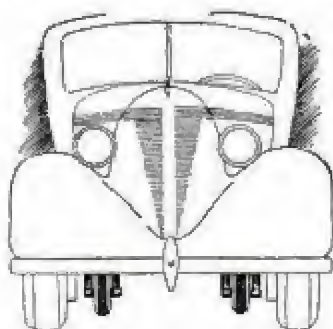
vice patented recently. Installed in the window, it consists of a seat with low back, strap-iron brackets with hooks at the inner end and a support for the seat at the other

end, a bearing bracket depending from the seat between the supports and a clamping screw in the bearing bracket. The window sash is lowered to a point just above the seat, giving extra back support.

**P**ATENTED recently, an illuminated street sign makes it easier to find directions in the city. The sign has glass panels on which appear the name of the street and the number. An incandescent lamp inside the housing provides illumination. Made in rectangular shape with a pyramidal-shaped top, the sign is mounted on a post.



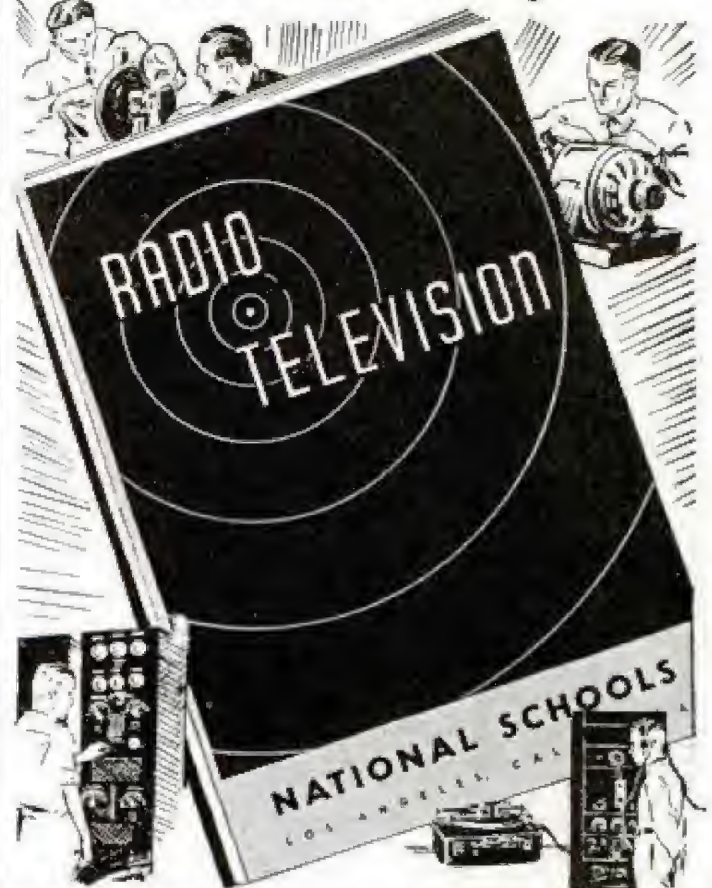
**R**EDUCTION in the danger from blow-outs of automobile tires is the purpose of a newly patented auxiliary wheel system. Two auxiliary wheels are attached to the automobile's "knee-action" spring equipment. Upon deflation of the auto's front



tires, the auxiliary wheels contact the ground immediately and support the car through the knee-action assembly. When the small auxiliary wheels are supporting the car, the regular steering apparatus may be used for steering the car, preventing accidents that otherwise might occur from inability of the driver to hold the vehicle on the road after a blowout.

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CITY \_\_\_\_\_ STATE \_\_\_\_\_



# OL' JUDGE ROBBINS

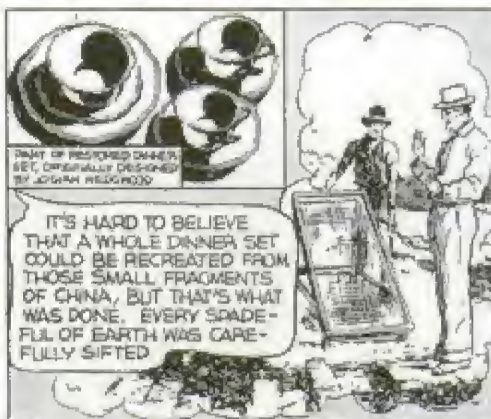
AT COLONIAL WILLIAMSBURG, VIRGINIA

HOW COULD ANYONE TELL WHAT WILLIAMSBURG LOOKED LIKE IN PRE-REVOLUTIONARY DAYS?

WELL, FOR ONE THING, THEY WERE GUIDED BY RELICS WE'LL SEE IN THIS OLD COURT HOUSE. THERE'S KEN WAITING FOR US



THESE MUSEUM EXHIBITS WERE DUG UP FROM THE RUINS OF BUILDINGS DATING AS FAR BACK AS TWO CENTURIES



REMAINS OF RESTORED DINNER SET, ORIGINALLY DESIGNED BY JOSEPH WEDGWOOD

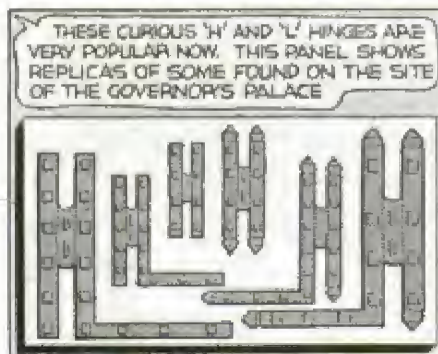
IT'S HARD TO BELIEVE THAT A WHOLE DINNER SET COULD BE RECREATED FROM THOSE SMALL FRAGMENTS OF CHINA, BUT THAT'S WHAT WAS DONE. EVERY SPADeful OF EARTH WAS CAREFULLY SIFTED



REPRODUCTIONS OF COLONIAL SILVERWARE



AN EXCITING FIND WAS A SMALL SILVER COFFEE SPOON THAT GAVE THE KEY TO A COMPLETE COLONIAL SILVER SERVICE



THESE CURIOUS 'H' AND 'L' HINGES ARE VERY POPULAR NOW. THIS PANEL SHOWS REPLICAS OF SOME FOUND ON THE SITE OF THE GOVERNOR'S PALACE



I RECOGNIZED YOU, JUDGE ROBBINS. WHAT DO YOU THINK OF THIS CHURCH-WARDEN PIPE? IT WAS DESIGNED FROM A PIPE BOWL FOUND IN THE DIGGINGS

VERY INTERESTING. THAT LONG STEM TELLS THE STORY OF HOW THEY TRIED TO GET A COOL SMOKE IN THE OLD DAYS



WELL, NOWADAYS WE HAVE A BETTER WAY TO KEEP OUR SMOKE COOL AND MELLOW. EH, JUDGE?

I SHOULD SAY SO. PRINCE ALBERT CERTAINLY HAS SOLVED THE PROBLEM OF GETTING A MILD, COOL SMOKE!

Copyright, 1938, R. J. Reynolds Tobacco Co.

**THEY'VE ALL FOUND THE KEY TO MORE SMOKING JOY!**  
—A Milder Pipe Tobacco That's Tastier Too!

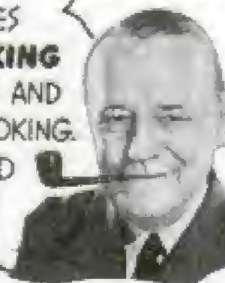


**RICH TASTE COMES FIRST WITH ME. PRINCE ALBERT IS FULL-BODIED, YET NEVER HARSH**

TRAINMAN

I FIGURED OUT WHAT ASSURES **BETTER PACKING AND DRAWING AND MELLOWER SMOKING.** SO I SWITCHED TO P.A.—IT'S **CRIMP CUT**

SCIENTIST

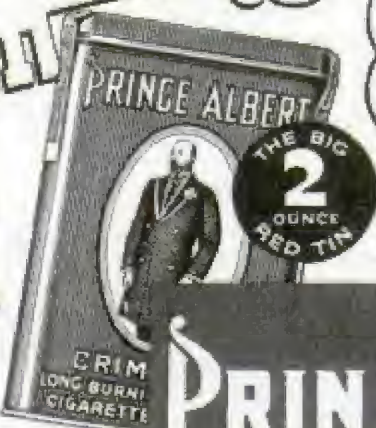


BETTER FOR "MAKIN'S" SMOKES TOO

I CAN PAY THE PRICE OF ANY TOBACCO, BUT PRINCE ALBERT HITS ME RIGHT FOR **MILDNESS**—IT'S **NO-BITE TREATED!**



CONTRACTOR



**BETTER—OR IT'S OUR TREAT!**

Smoke 20 fragrant pipefuls of Prince Albert. If you don't find it the mellowest, tastiest pipe tobacco you ever smoked, return the pocket tin with the rest of the tobacco in it to us at any time within a month from this date, and we will refund full purchase price, plus postage. (Signed) R. J. Reynolds Tobacco Company, Winston-Salem, North Carolina.

**PRINCE ALBERT**

THE NATIONAL JOY SMOKE



# Popular Mechanics Magazine

REGISTERED IN U. S. PATENT OFFICE AND CANADA

WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 69

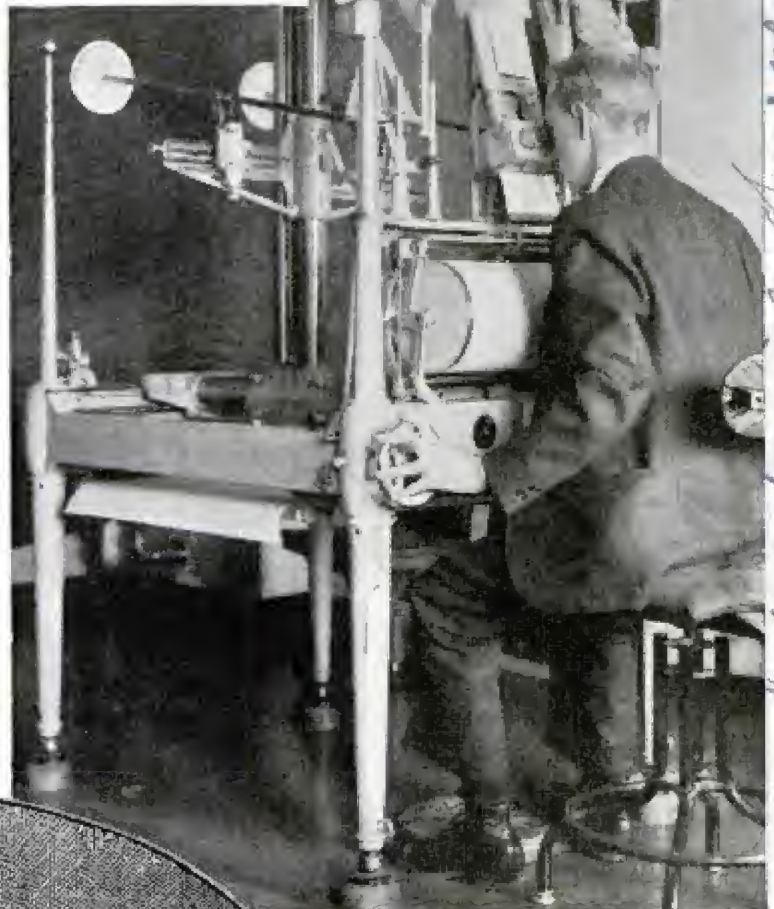
MAY, 1938

No. 5

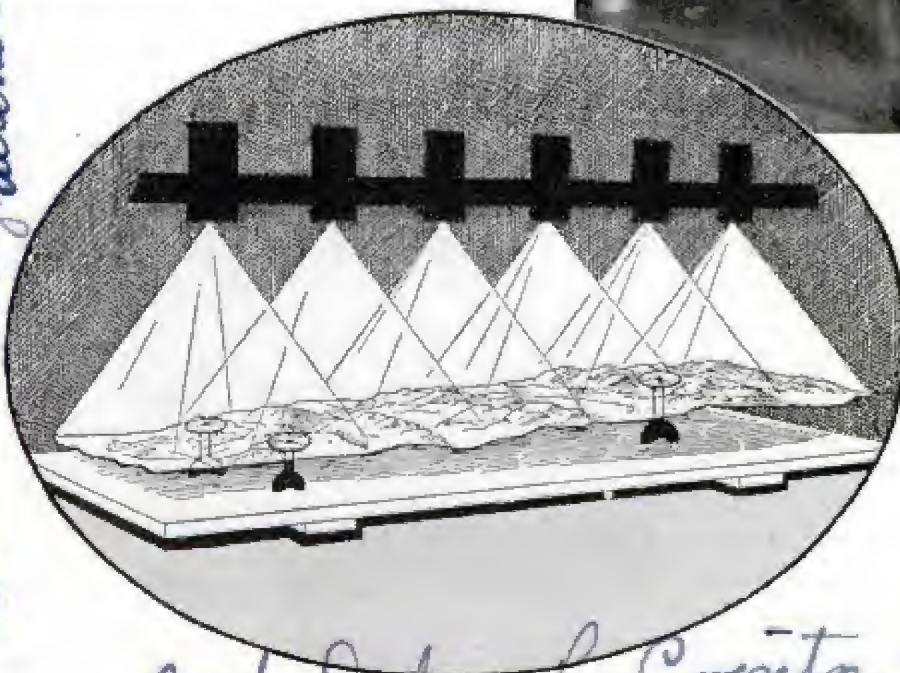
## SURVEYING *by* PHOTOGRAPHY

**M**ODERN engineers may survey a jungle coast of a Central American republic or frozen Arctic wastes without stirring out of their private offices. A revolutionary method of surveying has been brought about by the high development of aerial photography and its application. The new science is called photogrammetry.

Not many years ago the engineer who wished to know features or boundaries of any section of the earth ran his transit lines on foot. Days and weeks were required for this operation, even over a small territory. In tropical countries, his crew had to chop through jungles and wade swamps and reptile-infested streams. In Arctic lands,



*U. S. Geological Survey*



Top, photogrammetrist making contour of topography maps from aerial photographs. The operator is peering through a stereoscopic lens and his hand rests on an adjustment wheel. The resultant map is traced on a paper record on the revolving drum. Bottom, drawing shows how multiplex projector works. Light from the projectors overlaps on the photograph so that the operator sees it in a third dimension

*Carl Zeiss Jena*  
*Carl John L. County, The Maury*  
*Abertments. 19th and 40 Sts. N.W.*





*Top, old-fashioned stereoscope's optical illusion of a third dimension is the basis of the photogrammetrist's art. He catches it on his complicated machine and transfers it to paper in the form of topographic or contour map*

snow, ice and extreme cold had to be conquered.

Everybody recalls the small stereoscopes our families kept on the parlor table at home and which were used as a means of entertainment in looking at twin pictures mounted on a card. Looking through the stereoscope, it was possible to see the view in three dimensions. One felt that it might be possible to reach in and touch the objects shown in the view with accurate judgment as to their distance. This same principle is employed by the photogrammetrist, with one difference. He actually does reach in and touch the objects shown and reproduces them in their true aspect on a map. Two successive overlapping pictures taken along the flight of an airplane are used as a pair to produce the stereoscopic effect. A pointer in his hand does the rest. In this manner the photogrammetrist draws the ground in relief as one would see it by natural vision, hills, valleys, mountains, canyons, showing.

The photographs show perspective views of the ground with variations in scale be-



*Center, how aerial camera works. Section marked off on ground is resulting picture. Bottom, surveyor working on foot has difficult job*

cause of the variations in the altitude of the airplane at the various times the pictures were taken. Distortions in the views of the ground exist because it is impossible to level a camera accurately in a moving airplane. It is here that the photogrammetrist takes hold. He converts these perspective views of an area into a true plan, correct in scale and shape, by correcting all the distortions in the pictures themselves. Where photographs of the ground area are too large to be shown by a single picture they are pasted together like the parts of a large picture puzzle. Such an assembled picture is called a mosaic. It is not complete or accurate enough to be called a map.

In making a topographic map at a desk from aerial photographs several types of instruments have been devised. In these the operator sees an image of the ground to be mapped spread out before him in

(Continued to page 149A)

*Photogrammetry is a difficult job*



H 252.

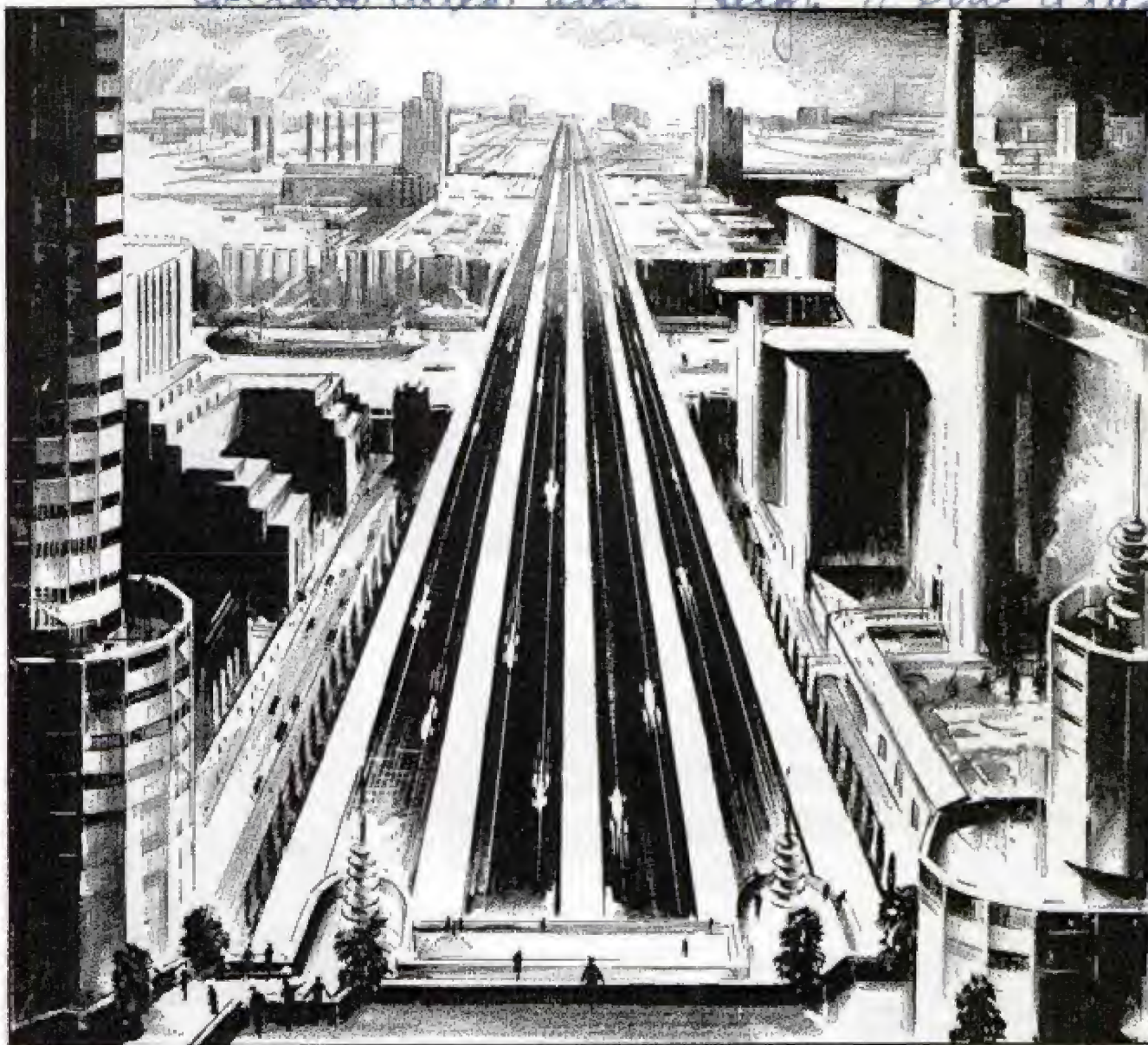
Hafmeister, Associate Architects  
Rockefeller Centre, New York City

POPULAR MECHANICS

643

# Super-Highways for 100-Mile Speed Proposed

*collaborated with Hugh Ferriss artist*



© Warren Bros. from Wide World

Here is the artist's idea of how the super-highway of the future might appear. Present plans call for twelve lanes of traffic, six in each direction

Twelve lanes wide and constructed so that speeds of 100 miles per hour might be attained in comparative safety, super-highways have been proposed to meet traffic needs of the United States. A bill for construction of ten such highways, three running east and west and seven north and south, has been drawn and given serious study by the government. The cost would be between \$6,000,000,000 and \$8,000,000,000, with the roadways to be operated on a toll system that would make them self-liquidating. Besides tolls, a concession plan is proposed to increase revenue. Sites would be leased for hotels, service stations and for many other purposes. Every effort would be made to keep

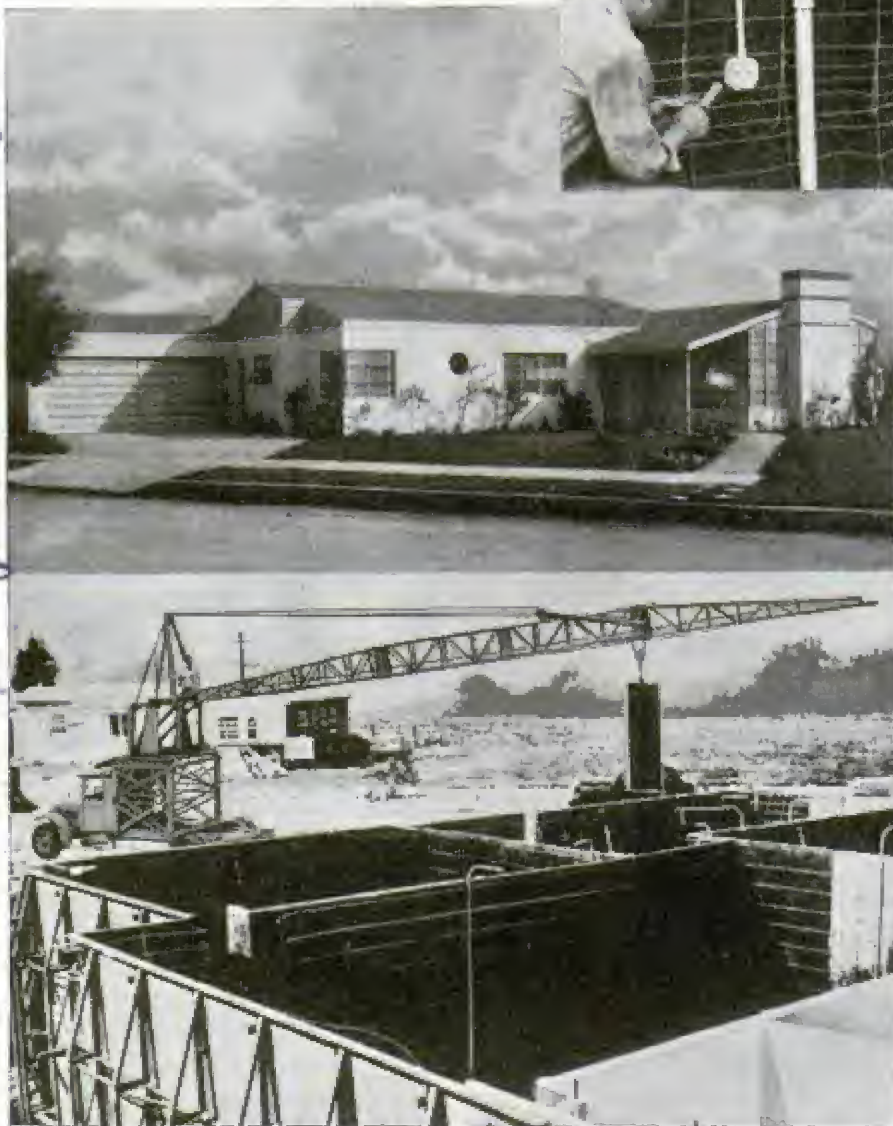
the highways attractive. A generous park strip would separate traffic into two-way streets or roadways, with six traffic lanes in each direction. Already the war department, seeing national defense advantages for its motorized army with such a network of super-highways, is interested in the bill. Among features of such a road operating between New York and Boston would be a block signal safety system. This roadway would run beneath cities and could be traversed in two and one-half hours, according to research experts.

Experimental heating plants to dispel fog around airports are proposed by the British Aeronautical Research Committee.

*Compressed Air Magazine*



*Right, how electric conduits and water pipes are installed. Below, placing form for pouring of concrete. Bottom, left, long crane used in building the house. Top, left, completed house*



mounted with a concrete mixer on a truck, lifts room-high steel forms for both outer and inner walls upon prepared foundations within a day or two. Newly patented forms are any width desired, to follow any architectural design. Collapsible cores, twenty-four inches long, six inches deep and the height of the wall, make possible hollow sections in the exterior wall. These



are separated by steel rods, vertically and horizontally, which form reinforced concrete studs about twenty-six inches apart. As the forms are set, steel wire reinforcing is placed on the inside, as also are electric wiring conduit, plumbing lines, window and door forms. The latter are removed after concrete is poured. When a new mix is poured continuously into the forms and placed electrically, no cement paste is lost by the close-fitting steel. Concrete sets rapidly and the forms frequently may be stripped one day after pouring. Ten-inch hollow walls, partitions as thin as two inches, even closets and bathrooms of single collapsible forms are thus formed in a remarkably short time, and the building is well advanced toward completion. At this stage windows and doors are framed in concrete, plumbing and electric lines are poured in and accessible, and most trim is eliminated. The steel forms eliminate objectionable form marks, giving a wall smooth enough to require no plaster. The hollow sections provide insulation against extremes in heat or cold and condensation of moisture. The system includes new methods of pouring moistureproof floors on the ground. Roofs for many low-cost houses may be precast on the ground in sections and lifted into place by the crane, to be cemented in. One model concrete house has seven rooms, forced-draft air cooling and heating, corner windows up to roof line, poured concrete chimney and mantel, concealed metal gutters and downspouts, lightweight metal doors and cabinets, deep window reveals and a living-room floor sunken below ground level. Its cost, including the cooling and heating plant, is approximately \$6,000.

Ⓢ The word "Teletype" is the registered trade mark of the Teletype corporation. 1400 W.

## Hunters Ride "Swamp Cruiser" through the Everglades



*Hunting deer, boar and wildcats in the Florida Everglades aboard a truck that can wade three feet deep in the swamp*

Guy Peebles, Miami sportsman, goes hunting in the tangled Everglades of Florida much as tiger hunters in India go mounted on elephants. He has built an "Everglades cruiser," a powerful truck that can travel in swampy water three feet deep.

## Hole-a-Minute Hydraulic Borer Reaches over Fence or Ditch



*Driving the auger at any angle, this borer can drill an ordinary post hole in a minute and then set up the pole*

Lifting its long arm over fences and past ditches, a hydraulic borer with a twenty-foot reach can dig post holes and then set up the poles, saving time by doing both operations. It can bore holes up to a sixteen-inch diameter and seven-foot depth.



Mary Bodwell  
means of promoting ro-



*Top, kissing telegraph blank. Center, rushing copy to facsimile machine. Bottom, kiss coming from the receiving machine*

club



Ocean liners may grow "wings" to smooth out the pitching and rolling if the theory of a German shipbuilding engineer is adopted. He proposed that wings or planes be attached to the vessel to serve as

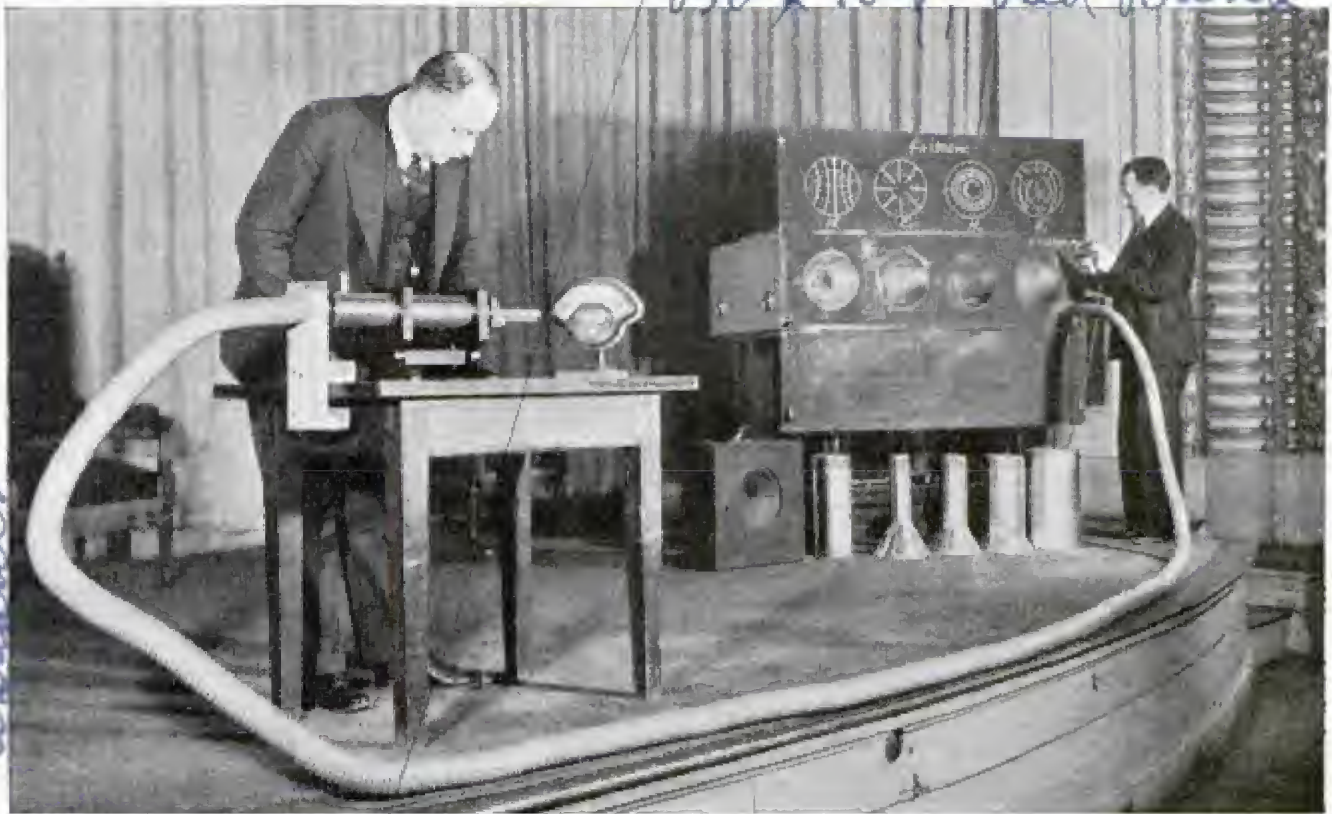
balancers. The method has been tried on small boats with success, but further study and experiment, with respect to wind and water resistance, must be carried out before it can be applied to ocean liners.

German Railroads  
in after  
nope  
65-54  
Emb. Floyd  
Jiffy Baggage  
#28

attached to the vessel to serve as a life preserver. It is not until now, however, that the device can be applied to ocean liners.



# Television Signals Flow through a Metal Pipe



*Substitution of flexible tubing for the expensive coaxial cable is seen as a possibility through the success of this experimental transmission of ultra-short wave television signals through a thirty-foot pipe*

Until now, costly coaxial cable has appeared to be the only means of "wiring" television signals. Dr. George C. Southworth of the Bell Telephone Laboratories proposes to "pipe" the ultra-high-frequency waves through a metal tube. He demonstrated the transmission of short

waves through a flexible metal pipe thirty feet long, and in experiments has transmitted frequencies as high as 3,200 megacycles, waves less than four inches long, for a distance of 1,000 feet. Coaxial cable at present is limited to frequencies of only two or three megacycles.

## Power Saw Is Run by Tractor with Takeoff Attachment

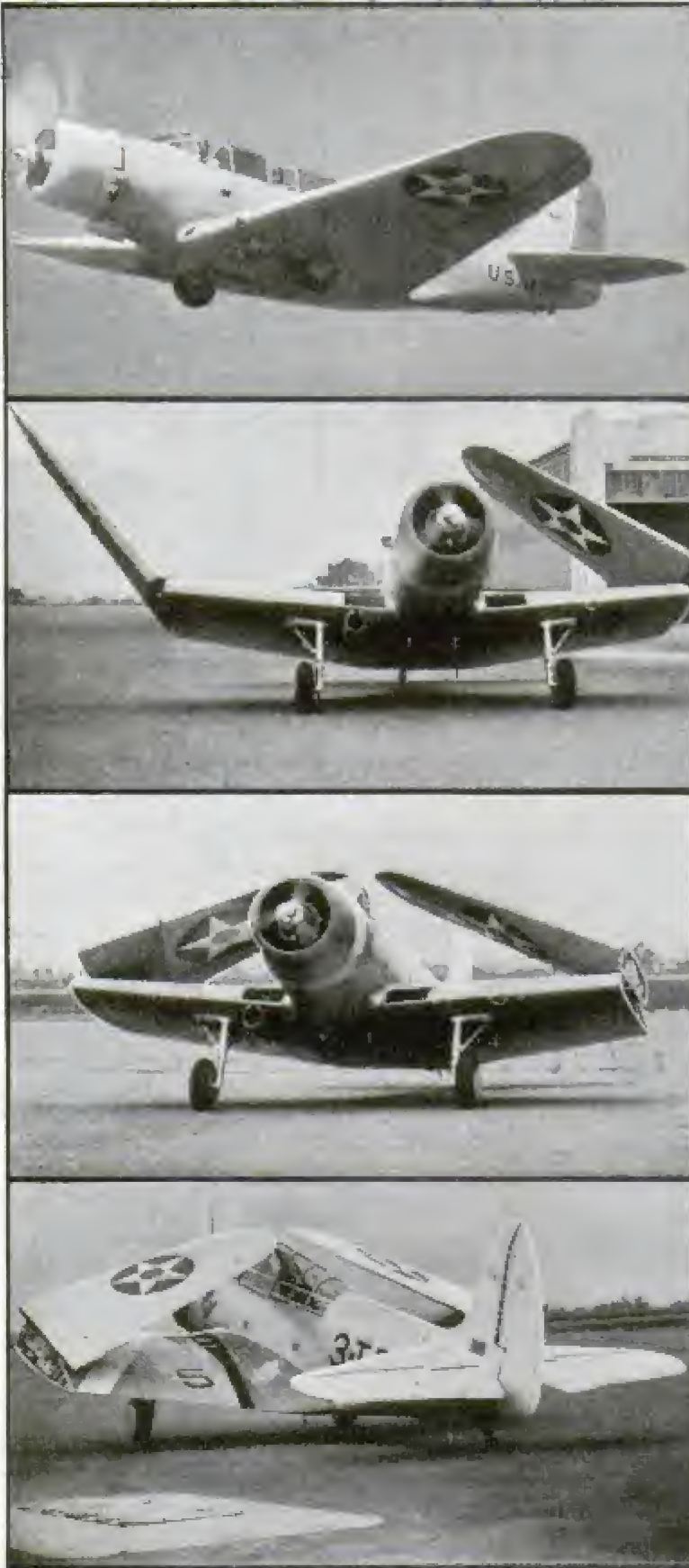
Operated by the power takeoff attachment on tractors, a new drag saw cuts logs into blocks for splitting into fuel. One man, working the power saw, accomplishes the results of ten men using cross-cut saws. A small sprocket pinion, clamped and keyed to the power takeoff shaft, drives the saw. The saw blade can be lifted easily from one cut to another as the tractor is moved along the log. Equipped with an adjustable safety slip clutch which automatically throws it out of gear if the blade pinches or meets an obstruction, the saw has a nineteen and one-half inch stroke.



*Sawing logs with aid of power takeoff attachment on tractor*



# Navy Plane Folds Wings as It Taxies on Deck



Navy aircraft carriers can multiply their "broods" of fighting planes if this folding type is adopted generally. Power from the motor winds up the wings while plane is still rolling along carrier's deck, and it is speedily ready for storage below decks

Torpedo bombers that crank up their wings as soon as their wheels touch the deck of an aircraft carrier are the navy's latest answer to the problem of space limits on "mother" ships. This new breed of fighting birds does not wait for a crew of mechanics to unlock its spread wings and fold them back. As he taxis along the deck the pilot operates the controls which, taking power from the single motor of the plane, folds each wing upward until it nearly rests against the cockpit. Almost as soon as it alights, the plane is ready to ride down the carrier's elevators to its cramped storage space. The first of these low-wing monoplanes has been turned over to navy test pilots for trials. Engine power is used both for folding and unfolding the wings.

## Car Air Cleaner Is Washed by Fluid under Pressure

Automobile air cleaners must be "taken to the cleaners" themselves periodically, and a special washing machine for this service has been developed. First it forces a stream of cleaning fluid through the air cleaner by compressed air. Then the fluid is drained off and air is driven through the cleaner until it is thoroughly dry. Finally a spray of oil is forced through, completely re-oiling all parts of the cleaner.



Crater lake in Oregon is the deepest in this country, so deep it never freezes over although it lies in a cold, high region of the Cascade mountains.

Douglas Aircraft Co., Santa Monica, Calif.

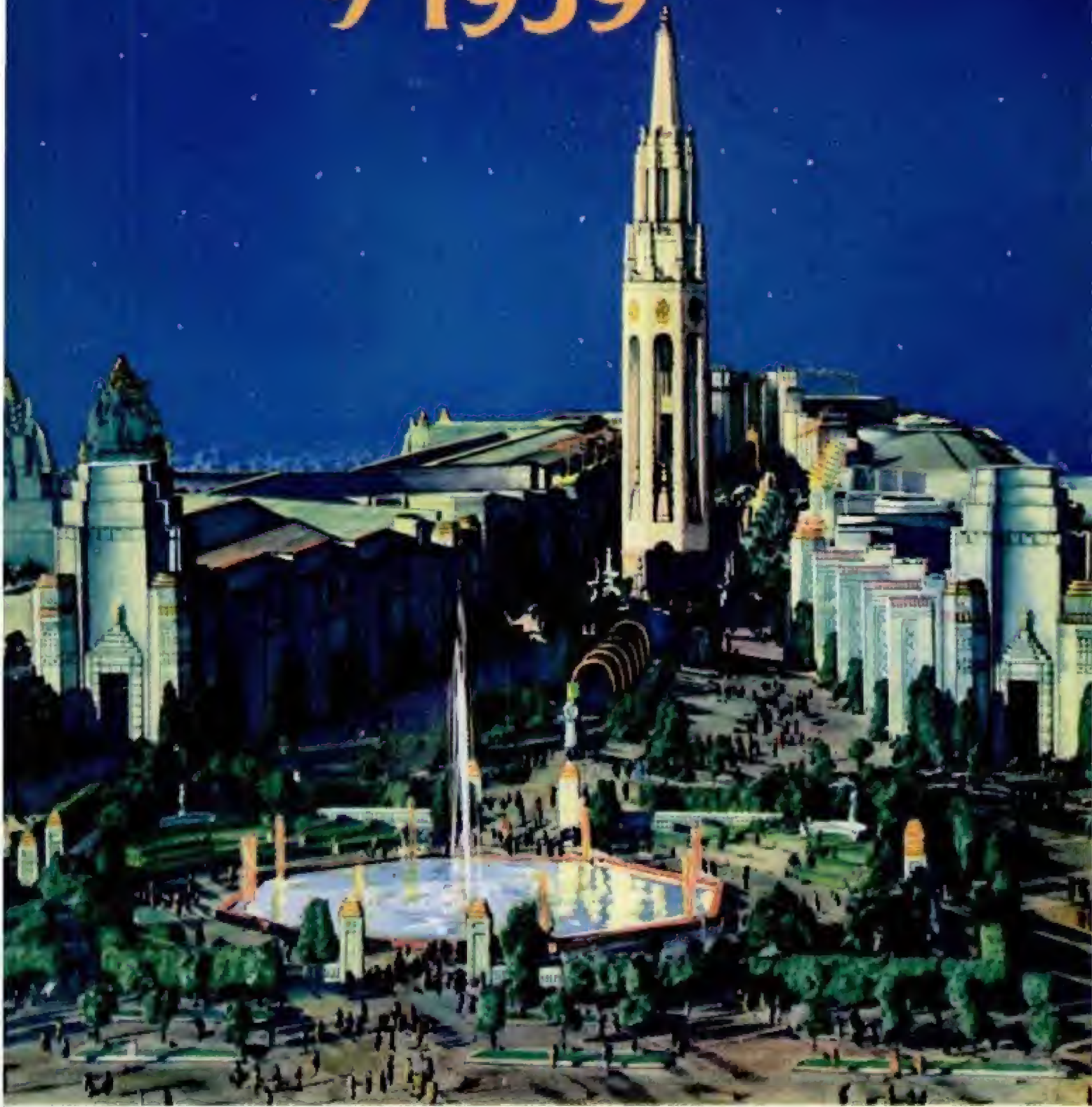
Vulcanizing Co. of V. Paul, mechanical

Scientific Monthly. July 1938



*Left foreground Hall of Mineral Empire p. 57308*

# TREASURE ISLAND of 1939



649

*Right. Palace of Homes and Industries*

MODEL of south gardens of 1939 Golden Gate International Exposition as they will appear on Treasure Island in San Francisco Bay. The view is north, past the 400-foot central tower and along the "Avenue of the Seven Seas" to the terminal "Theater of the Sky."

*Designed by late George W. Kelham, A.I.A.  
B. 1939*



es/386



from shore of Yerba Buena Island.

Cont. Thomas G. Stearns, Jr.  
0555 Holman Ave. Los Angeles

**GOLDEN** Gate International Exposition Island in San Francisco Bay as it will appear in 1939. Right, painting depicting the "Spire to the Sun" at night. Designer - Arthur Brown, Jr.

**N**EXT year millions of people are going to explore a brand new island in San Francisco Bay more fabulous than the treasure island of storybook literature. Raised from the bottom of the sea, the 400-acre tract of land will be the scene of the 1939 Golden Gate International Exposition.

Visitors will walk down a flower-lined street, the "Avenue of the Seven Seas," to dozens of buildings containing exhibits of the world's industries and crafts, gathered from lands on all sides of the Pacific. Native villages, trade ships from foreign countries, entertainers from many lands, spectacular shows, and working models of recent scientific developments will be on display.

At this exposition visitors can take part in actual gold-mining operations



650





651 SKETCH of exposition's main portal, blending several forms of architecture. The pyramids converge into towers supported by formalized elephants.

conducted in an artificial mountain of ore hundreds of feet long and fifty feet high. They may climb into the latest sub-stratosphere transport planes, or descend to the bottom of the bay in captive submarines. Robot planes and rocket planes will be there for inspection. Visitors will see beans growing in a bathtub without soil, a full-scale working model of "Old Faithful" geyser, and a \$1,000,000 relief map of western America so large they can walk along paths that represent state borders.

Inside the buildings they will find industrial and cultural exhibits galore. They may have ringside seats at demonstrations of smashing the atom, uses of black light, the electric eye, electronic music, television, and other marvels of research. Chemical agriculture, high-

speed indoor farming without soil, will show the possibilities of vegetable culture by city dwellers. There are no crop failures on a chemical farm and most vegetables may be harvested from three to six weeks after the seeds are planted.

These and thousands of other wonders will be housed in a city of twenty-seven major buildings. The architectural scheme of the exposition is that of a walled city with a system of interior courts, employing a style of architecture that applies to the whole Pacific, and in which spectacular phases of Occidental and Oriental design are incorporated. Buildings reveal Mayan, Cambodian,

Reference - Paul Conant, manager, Magazine





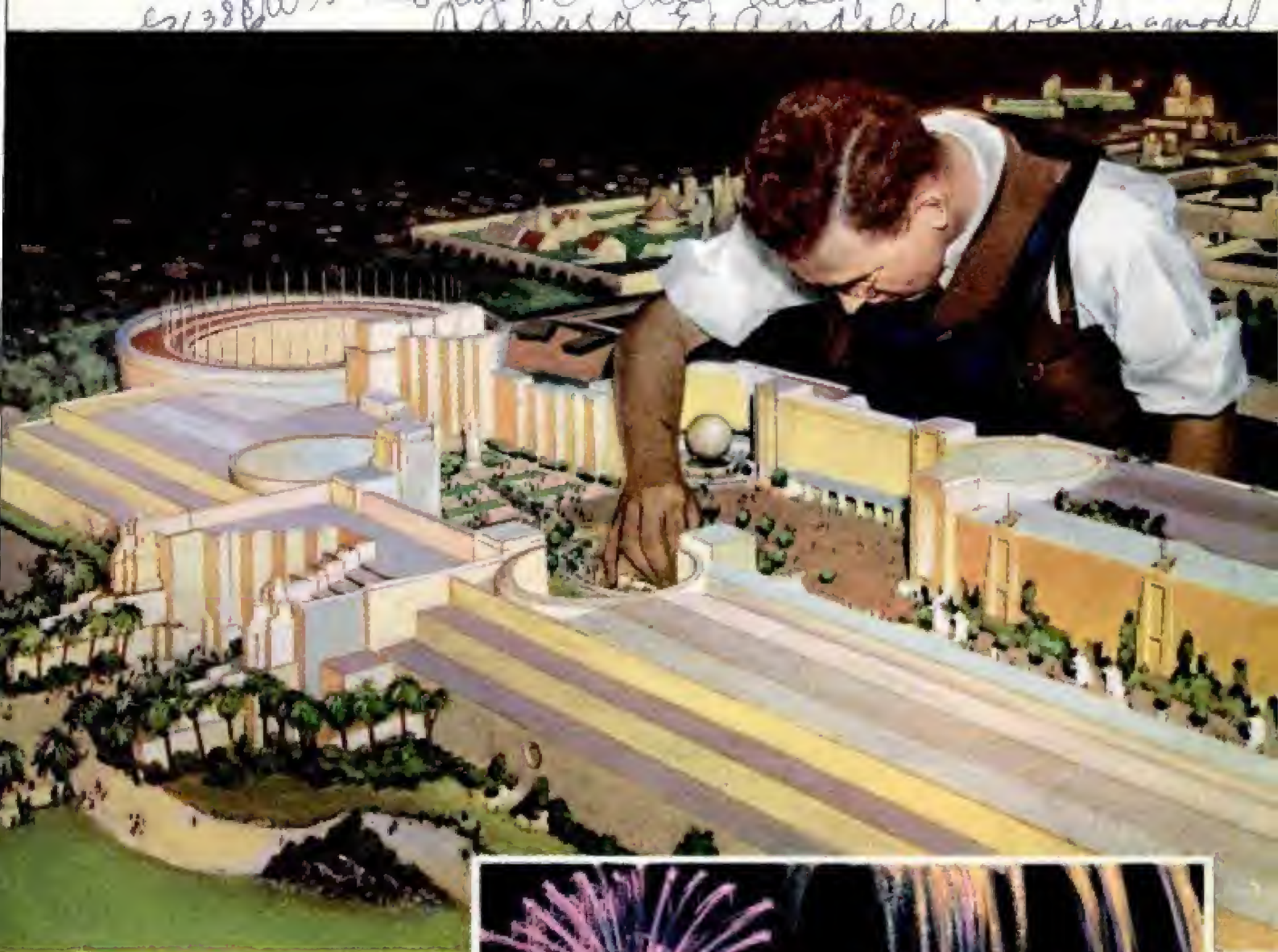
"LAKE of All Nations" and "Temple of Music" as they will appear next year. In the background is depicted the federal building group.

652  
and Incan themes in shape or decoration. Some are flat-roofed, others have domed exteriors, and still others are set off by multi-colored towers. The exhibit halls will be windowless, artificial light being used all through the exposition as well as up-to-date air conditioning.

The elephant, mammoth beast of pageantry, will be a predominating decorative note, first apparent in the majestic pyramids that flank the main entrance to the island. Flaming banners and "sound" pylons containing hidden loud speakers for music and with flambeaux of flames and colored vapor streaming from their tops are being erected throughout the grounds.

Exterior illumination is to work magic after dark. Floodlighting will throw soft glows against the colored walls. Newly developed shades of apricot, peach, and golden light are to be used in some areas, with a "moonlight blue" and a lifelike sea green in others. Some surfaces are to be treated with new mixtures of fluorescent paints that glow when exposed to the rays of "black light." The board of architects has had the problem of creating a colorful and stimulating group of buildings that at the same time harmonize with the sweep of the bay, the near-by giant bridges, the Golden Gate, and the skyline of distant hills and cities. One of their achieve-





**MODEL** builder working on one of the exposition groups. Right, golden-domed "Temple of Music" as it will appear during night fireworks display.

ments has been the planning of a "visitor-circulation" system that places every part of the island within easy reach by direct step-saving routes.

Still a year away, plans for this fair started almost a decade ago. Preliminary construction has been going on since 1936, when the site was merely an area of shallow water known as Yerba Buena Shoals in the middle of San Francisco Bay, not far from an island through which the San Francisco-Oakland Bay bridge passes. The shoals were from two to twenty-six feet under water. First 20,000,000 cubic yards of sea bot-







INSIDE the towering Midway entrance will be found "Forty Acres of Fun" where the weird wonders of Oriental lands will contrast with the sophisticated showmanship of the Occident.

654 tom were dredged up and placed inside rock walls to an elevation of thirteen feet above the water. The island today is more than a mile long and three-fourths of a mile wide. It required sixteen months of continuous pumping by eleven dredges to complete. It is connected to the bay bridge by a 900-foot permanent paved causeway. Ferry slips and terminals are being built on two sides of the island at a cost of \$500,000 and provisions have been made for small craft and flying boat landings. After the exposition is ended the island will be converted into a great mid-bay airport.

When the island was completed it was necessary to "unsalt" its sandy soil by a leaching process so plants would grow readily. In addition, the soil is being improved by the admixture of 50,000 cubic yards of rich loam brought across

the bay by barges. The horticultural program includes the planting of 4,000 trees, 70,000 shrubs, and 700,000 flowering plants. One of the marvels will be a twenty-five acre "Persian rug" of blooming flowers planted closely in a typical design. Another will be a collection of orchids ranging in value up to \$10,000 per plant, with a demonstration of orchid growing by the seedling method.

Many of the trees and shrubs already gathered for the exposition, including orange trees, hibiscus, datura, eucalyptus, Birds of Paradise and rare silver trees and palms, are being acclimated in a "tree hospital" in San Francisco, which also contains electrically heated propagation beds in which small plants will be brought to bloom just as they are needed.

Since the island is to be converted





HERE is how the exposition grounds are linked with the San Francisco-Oakland Bay bridge. Right, part of south court and gardens as they will appear at night.

655 designed by George W. Kerkham

into an airport after the fair, only three of its buildings have been constructed for permanence. These are an \$800,000 concrete air-terminal station that will serve as administrative quarters for the fair, and two huge \$400,000 steel and concrete hangars, each 335 feet long and seventy-eight feet high, which are to be used temporarily as the palaces of fine and liberal arts and for foreign exhibits. Plaster-covered wooden structures of similar size, bolted together for ease in dismantling, will house the exhibits of electricity and communication, agriculture, business progress, health and education and similar subjects.

A spectacular hall of western states will be centered around a diorama of vacation trails of western America and will contain full-scale exhibits of typical scenery, including flowing waterfalls and growing trees.







A \$2,000,000 livestock pavilion is being constructed on the San Francisco mainland as an adjunct of the exposition.

The hall of the mineral empire will contain a heaped-up mountain of ore, with a stream flowing along its base so scale miniatures can demonstrate placer mining, gold boat dredging, hydraulic mining and gold mill operations. Tunnels through the mountain will permit visitors to go underground to see true reproductions of hard-rock mining operations.

A \$20,000,000 art exhibit is to be displayed, probably for the first time under perfect lighting conditions. Weeks of experiments have been undertaken in a model gallery, involving thousands of light meter tests, so exact lighting can be determined for properly showing the oils,  
(Continued to page 128A)



*Island State bridges background*  
WHEN the fair is finished, the man-made island will become the airport pictured here.  
Top, W. G. Pigeon, chief designer of model of Golden Gate International Exposition.



# Complete Office for Writer Built in One Piece

Designed as a compact workshop for writers and artists is a "one-piece office" now on the market. It combines with a comfortable upholstered chair virtually all the appurtenances of a modern office. There are file drawers and stationery compartments, bookshelves, work desk, typewriter table and telephone stand, and a swivel stand that will hold a large dictionary. An adjustable shaded reading lamp and a leg rest are included.



## "Robin's-Egg Blue" Hides Blimps in the Sky

Closely resembling "robin's-egg blue," a color developed for painting U. S. Navy blimps matches almost all color conditions of the sky, thereby serving to camouflage the ships. The color has a dull finish and does not cause the glitter resulting from use of aluminum paints, making it less conspicuous to observers. Aluminum paint has been used because it refracted the sun's rays, protecting the gas from expansion resulting from absorption of the sun's rays by the bag.



Three views show how complete is this one-piece office, with bookshelves, filing drawers, writing desk, dictionary stand and comfortable chair

## Vacuum-Cleaner Motor Gives Hedge "Electric Shave"



With a vacuum-sweeper motor furnishing the power, you can give your hedge an "electric shave" in fast time. This hedge trimmer weighs only ten pounds and can be plugged in on any light circuit, using a long cord. Both motor and handle are borrowed from the vacuum cleaner. Two blades cut the hedge neat and smooth. The lightweight trimmer is easy to operate.

On one western railroad's mountain excursion train there is a photographic dark-room for developing and printing pictures on the homeward trip.

Trimming hedge with cutter driven by light motor

Yantis Electric Hedge Trimmer (Business Week) Feb 5 1938



# THE PHANTOM



*A test driver "goes to town" in a sand pit. He is giving the steering gear of this Plymouth some severe punishment. Left, engineer examining chart which shows spring has taken two days of "bumps" in the laboratory*

By H. W. Magee

## PART I

THE guinea pigs of the auto industry used to be the early birds who bought the first new models each year. These unsuspecting martyrs to engineering progress unearthed the "bugs"—the flaws in materials or the errors in design which had crept into the new cars. Those days, happily, are gone forever. Each factory today

has its own guinea pigs—the torture chamber and the "hell driver"—which find mistakes before they are carried into production. When you buy a new car now, you buy a triple-tested product.

Modern cars, first of all, are tested before they are built. Although their 1939 models are not yet assembled as complete cars, Chrysler engineers, for example, know almost as much about the performance of next year's models as they used to know about models which were in production.

They know what next year's cars will do because each approved part has survived the torture chamber—the test laboratory where, in a few hours or a few days, each unit under consideration for a new model is given more punishment than it will receive in years of driving. But the fact that a part withstands a laboratory beating is not enough. Perhaps road conditions were not duplicated exactly in the test room.

So the supreme ordeal comes when the laboratory tested parts are assembled into complete cars. Then, in the case of Chrysler, a phantom fleet—next year's models in disguise—takes to the open road. And there, on the greatest proving ground in



# FLEET of the HIGHWAY



the world—America's 3,000,000 miles of highways—the 1939 models will be put through their paces. Into production will go the parts which survive the worst the torture chamber and test crews can offer.

But long before any part goes into the phantom fleet, it has emerged with flying colors from a road test more severe by far than any punishment it is likely to receive in service. If the part comes unscathed from the laboratory third degree, it is turned over to a merciless driver with orders to "give it the works." He installs the part on a test car and proceeds happily to the meanest spot he can find for a workout. Then he cuts loose.

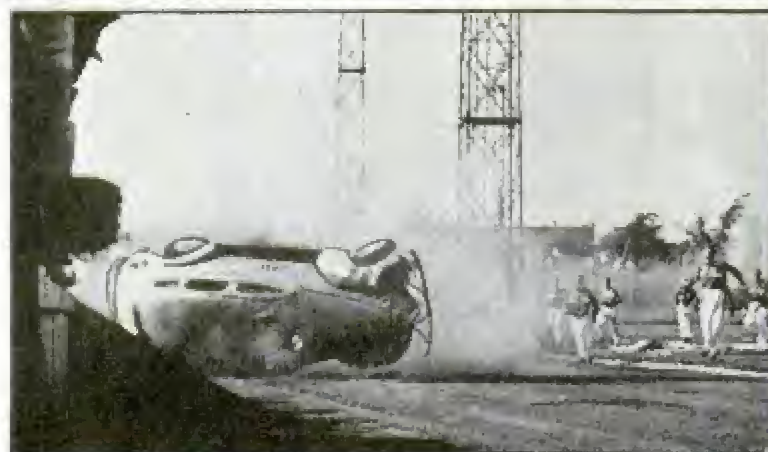
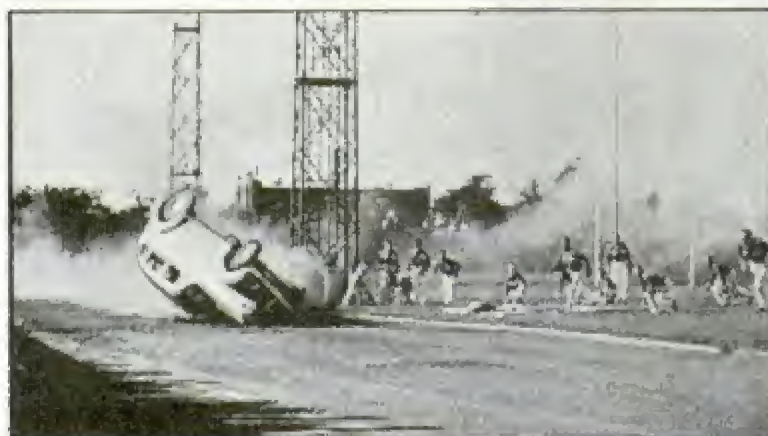
Two policemen in a scout car were creeping cautiously along an icy pavement near Detroit last winter when they observed a crazy driver seemingly intent on wrecking his car in a frozen cornfield near the road. Bumping, pounding, skidding, he was racing a big black sedan in erratic circles. With wild bursts of speed, he aimed straight for the deepest ruts, jolted along until he stalled, then shot into reverse and whizzed backward in a dizzy turn. Bouncing and swaying, he reached one end of the field, then backed toward



Photos courtesy Chrysler Corporation

*Plymouth*  
The smiling fellow standing on the windshield is about to drop a steel ball on the safety-glass-to-test its shatter-proof qualities. Below, steering wheels are tested by dropping bags of sand on them





A stunt driver in a Plymouth demonstrates that the modern car can "take it" by doing a double roll. Top photo shows him running onto a ramp to start the roll-over. The second picture shows him half way through the first roll, the third shows him completing the roll and the fourth shows him going into the second turn—perhaps a trifle dizzy by this time

the road with throttle wide open.

Hastily the officers leaped from the squad car. But the maniac at the wheel met misfortune before he reached them. Two wheels slid into a shallow ditch. He spun them forward, backward, forward again. The car only settled deeper. He was stuck. Whistling, he hopped out, sized up the situation, then beckoned to the cops. Cautiously they approached.

"Having lots of fun?" one of them asked sarcastically.

"Nope," replied the wild driver. "Just working. I'm a Chrysler test driver. Giving some experimental springs, brackets and shock absorbers a little workout."

"They must be pretty good," hazarded one of the officers.

"Wait until I finish and I'll tell you," answered the test man. "How about helping me out of this ditch?"

Soon he again was hammering over the ruts. Down the road the officers stopped to investigate the actions of another unusual driver. He was backing onto glare ice, then, with the accelerator pressed to the floor and engine roaring he waited hopefully until the car crept forward to dry pavement and the wheels grabbed. He, too, was a test driver.

"They told me," he explained, "that I couldn't snap this axle shaft with the full force of the motor. Looks like they might be right."

In a near-by sand pit a third driver went plowing and twisting through deep sand and dirt.

"What's that fellow doing?" demanded the officers of the axle tester.

"He's trying the steering gear which may be on your patrol car next year," replied the test man. The policemen were impressed, so impressed that they never batted an eye a little later when a motorist skidded at a slippery corner and executed a complete about face.

"Just another fellow testing



something or other," they told each other.

Day after day these hard-boiled drivers abuse and misuse one experimental part after another. If a part fails, the driver returns grinning. Engineers may know their stuff, he opines, but it takes a test driver to prove it.

Eventually, even the test drivers can find no more flaws. Weak spots they uncovered have been



*Adding sludge, above, to clean oil during a test of oil filters. Left, engineer reading "flowmeter" on Chrysler test car*



dallions have been removed and adhesive tape covers all identifying names and insignia. The cars are nameless—a phantom caravan.

Now comes the supreme test, —a 25,000-mile run over the very roads next year's owners will drive. At the steering wheels are the hell drivers, six keen-eyed men with half a million miles of driving behind them, professionals who know the country's roads like a book, men prepared to shove these cars mercilessly, hour after hour, day after day, up and down mountains, across deserts, through mud, pounding over gravel, struggling through sand.

In each car is an array of apparatus for measuring performance.

With the hell drivers are two or three engineers making the trip to watch their brain-children perform. Lead plates make up the weight of missing passengers. There's no babying the phantom fleet. Once out of Detroit, the leader tramps with heavy foot on the accelerator. From forty-five, speedometers creep to fifty, sixty, sometimes seventy miles an hour. Before sundown the caravan rolls into Dubuque, Ia.

Back to headquarters goes a long telegram filled with data and performance fig-

(Continued to page 146A)

corrected, where necessary, by changes in design or materials. The engineers have the drivers licked. Time after time, the test boys report the parts have withstood all they can give them.

And then, a few weeks later, a phantom fleet of hand-made cars rolls quietly through the gates of one of the Chrysler plants some morning at dawn. These six cars may be next year's Plymouths or Dodges or De Sotos or Chryslers but no one who sees them will know because me-



## Hydraulic Airplane Starter Adapted to Small Craft

*Coleman Dando, Esq.*

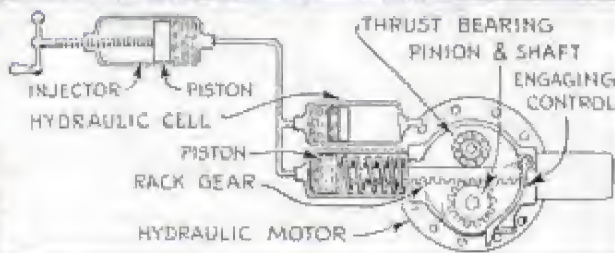


Photo and diagram show mechanism of hydraulic starter for light planes. It weighs under five pounds

*used on Cub*

Adaptable to the eighteen or more makes of small airplanes now being manufactured, a hydraulic starter weighing just under five pounds has been developed. Its cost is low, and maintenance expense is kept down by standardization of automotive hydraulic parts.

## Stainless Steel in Handy Rolls Latest for Home Builder

Made in convenient rolls for easy handling, stainless steel is available for home modernization, new homes and industrial use. Its surface is a sheet of strong, thin stainless steel, backed by a tough non-

*rustite*



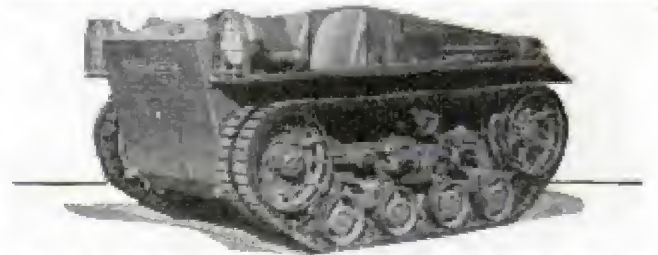
Demonstrating the ease with which the stainless steel sheet may be handled

metallic material. The backing is waterproof and flexible. Because of the backing, the steel can be attached easily to plaster, wood, fiber board, concrete and other surfaces. A special waterproof cement has been developed for this purpose. The backing deadens sound and has insulating qualities. The steel can be cut with heavy scissors, shaped or bent by hand and nailed, screwed or cemented into place. Moldings of stainless steel for trim and for covering edges and intersecting surfaces are available in adaptable shapes and styles. The material is manufactured in rolls two feet wide and fifty and 100 feet long, also in tiles four inches square.

*163*

## Fast Tractor Runs in Water Thirty-Six Inches Deep

Capable of operating in water three feet deep, the latest tractor attains a speed of twenty-five miles per hour. It has a track, a continuous band of rubber with a smooth



Two views of speedy tractor which can wade through water three feet deep

inner surface and plenty of "legs" on the outside. The track will not stretch nor lose its shape because it has a core of twenty to thirty endless, flexible wire steel cables gripped at intervals by the track guide or drive lugs. The drive sprockets impart their power directly to the cables and the rubber is used as a cushioning medium. The tractor may be pivot turned either from a standing position or from the highest forward speed. Its center of gravity is so low that it can be turned on the face of any hill it will climb.

*Maxim-Derrington Co. Inc. 111 Hudson St. N.Y.C.*

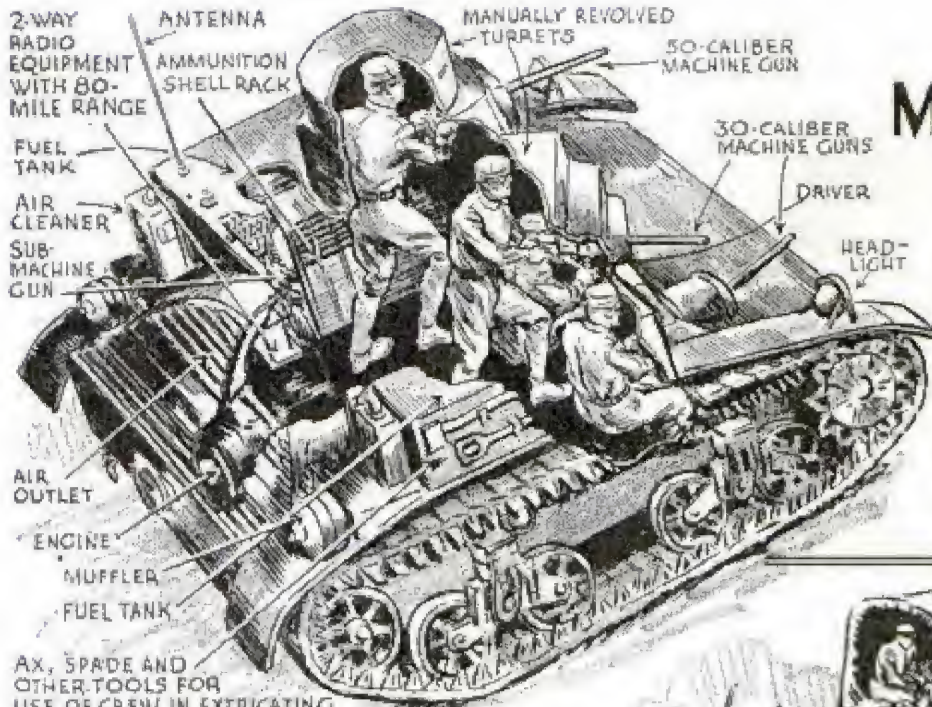
*Piper Aircraft Co. Lock Haven, Pa.*  
*Ludlum Steel Co. of Waterbury*



# OUR MECHANIZED ARMY

SOME OF THE IMPROVEMENTS WHICH ARE PUTTING THE UNITED STATES ARMY AHEAD OF THE OTHER GREAT POWERS

UNCLE SAM'S 19,000-POUND ACE MYSTERY TANK WHICH CAN REACH A SPEED OF MORE THAN 50 MILES PER HOUR ON GOOD SURFACES, AND 15 MILES PER HOUR ON 12% GRADES. IT HAS MADE A THOUSAND-MILE TRIP—INCLUDING PASSAGE THROUGH CITIES—AT AN AVERAGE SPEED OF 30 MILES PER HOUR



APPROXIMATELY 15-TON WEIGHT

PARKING BRAKES MANUALLY SET ON ALL WHEELS

HALF-TRACK TRUCK-OR 6-WHEEL DRIVE-USED IN HAULING GUN

WINCH USED IN EXTRICATING GUN IF IT BECOMES BOGGED SPEEDING UP THE TRANSPORT OF A 155-MM. GUN. BY USING BALL-BEARING RUBBER-TIRED WHEELS ITS SPEED COULD BE STEPPED UP FROM 6-8 TO 15 MILES PER HOUR

ELECTRIC CONTACT FROM TRUCK FOR BRAKING WHEELS

NEW LIGHT-ARMORED SCOUT CAR—AN IMPORTANT ELEMENT OF "MECHANIZED CAVALRY" FOR RECONNAISSANCE CONTACT AND LIMITED COMBAT. IT HAS A FOUR-WHEELED DRIVE ON A 1 1/2-TON TRUCK

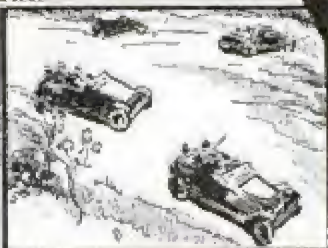
ASSISTANT DRIVER ARMORED SHIELD FOR DRIVER

50-30 CAL. 180-GR. SUB-MACHINE GUNS 2-WAY RADIO

IN ONE HOUR CAR CAN GO AS FAR AS IT TAKES A HORSE TWO DAYS TO TRAVEL THE HORSE AVERAGES 25 MILES PER DAY ON GOOD SURFACE

THE OLD CAVALRY AND THE NEW

GEARING ENABLES THE CAR TO CLIMB A 30° HARD DRY SLOPE FROM STANDING START



CARS WILL CONDUCT THEIR MISSIONS USUALLY IN GROUPS OF THREE OR FOUR

ROLLED COVER OF CAR FOR USE IN BAD WEATHER

CAR HAS EFFECTIVE RADIUS OF 250 MILES

TRIPODS FOR MACHINE GUNS IF CREW IS OBLIGED TO SALLY FROM CAR

SPECIAL TRACK AROUND TURRET PERMITTING QUICK MANEUVERING OF MACHINE GUNS

STOWAGE OF CREW'S PACKS

In addition to the U. S. army's budget estimate of \$421,000,000, the President has asked appropriation of \$17,330,000 for increasing modernization of army by such swift fighting machines as these

*Logan H. Clemons, 145 W. 45th, New York City*



## Water Softener for Laundry Attaches to Home Washer

*Econo Mizer*



Inserting fresh cartridge in the water softener which treats water as fast as it flows into washer

Soft, filtered water for the laundry can be had by attaching to the home washing machine a softener just put on the market. Its use is said to save fifty to ninety per cent in soap and considerable time in washing and rinsing, besides the protection afforded to clothing by filtering out any rust, pipe scale or sediment in the water supply. The metal cylinder, thirteen inches high, contains a softening element in replaceable cartridge form. The water is softened as fast as it flows from the faucet. The element can be regenerated by pouring in two cups of table salt and flushing it through in two minutes.

## Welding Nuts and Bolts Find

Wide Use in Industry



Many uses are being found in the industrial field for welding nuts and bolts. Especially

are the nuts and bolts valuable in the designing of metal appliances. For example, welding nuts may be applied in the internal parts of gas meters for the purpose of hanging or assembling brackets or other parts without incurring any danger of leakage through the metal shell of the meter. The same advantages arise in manufacturing electric transformers for outdoor use, electric refrigerators and storage tanks. Assembly of metal products, ranging from steel furniture to stoves, radios, automobiles and locomotives, is made easy by use of this nut. It has four welding points or projections which are of uniform height, thereby insuring satisfactory flow of electric current through the points of contact. The welding points are so spaced as to obviate any difficulty in setting up the necessary electrodes on the welding machines or any difficulty from molten metal splashing into the threads. Time required for welding the nuts to a sheet-metal surface is practically instantaneous. In many cases the nuts may be welded to sheet metal, eliminating the use of costly forgings and castings.

## Tight Squeeze in Irrigation Ditch Makes Car "Pull in Its Belt"

There is not much room for automobile traffic in an irrigation ditch. Nevertheless, a car has to be driven along the floor of a canal in the Yakima irrigation project in Washington to carry supplies for repairing concrete in dry seasons. The canal has



One man working a chain hoist turns abbreviated truck around in close quarters of irrigation ditch

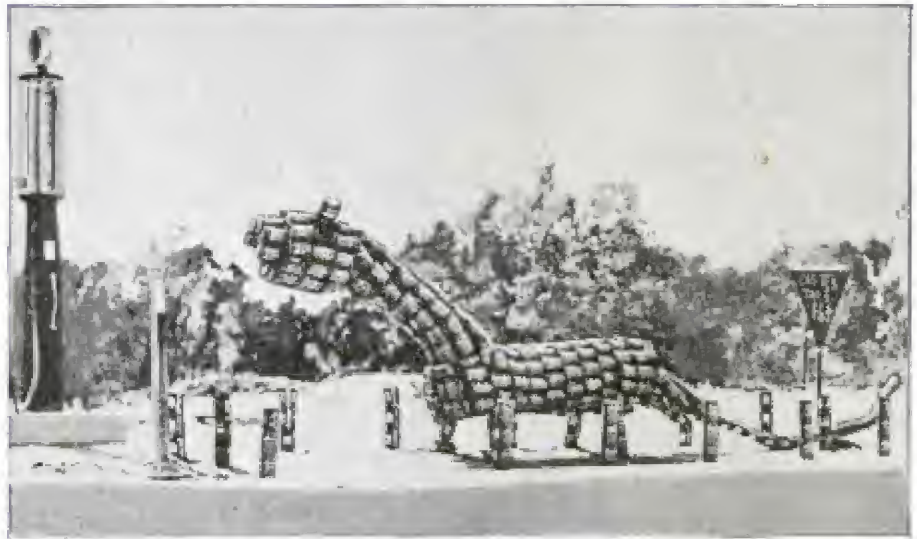
*J. D. Moore  
supervisor*



tunnels six feet one and one-half inches in diameter and its open sections are eight feet three and five-eighths inches in diameter. That's a tight squeeze, particularly when the truck must be turned around; so the engineers obtained an old Model T Ford chassis and cut it down to a thirty-eight-inch tread and a fifty-eight-inch wheel-base. It can be turned around in the radius of the open sections with a chain hoist operated by one man. A folding freight platform which can be tipped up when the truck is being turned was devised. When water is drained from the canal, the truck hauls a 1,000-pound load along the ditch at twenty miles an hour.

#225

## Dinosaur Made of Oil Cans Attracts Gas-Station Patrons



To catch the eyes of motorists, this "dinosaur" was built of empty oil cans at a filling station. A practical table was also made of cans

Tin cans can be put to novel and practical uses when life as a container is ended. Here is a prehistoric dinosaur "sculptured" in old oil cans, attracting attention of motorists to a gasoline filling station. A table sturdy enough to be practical was also constructed of tin cans.

## Infertile Egg Detector Saves Space in the Incubator

Slight changes will convert the ordinary egg candler into a detector that will re-



Inset, equipment for detection of infertile eggs. Below, candling the eggs

veal infertile eggs incubated only fourteen to twenty hours. Removal of these eggs results in saving space in the incubator. Light from a seventy-five watt electric-light lamp in the candler is passed through two glass slides, one green and the other yellow, and the egg is held up to this light. Identification is made easier if the operator wears blue eyeglasses. The embryo, at such an early age, covers an area on the yolk about the size of a dime and appears before the candler as a small dark spot. No such development can be seen in infertile eggs. Since ten per cent of all eggs set for hatching are infertile, removing these so early in the incubation period will greatly increase capacity. The average capacity of each commercial hatchery in the United States is 25,000 eggs, so removing all infertile eggs would increase the capacity by 2,500 eggs.

☛Inquiries as to makers of articles described in Popular Mechanics, will be answered by our Bureau of Information upon receipt of return postage.

Dr. C. W. Knowlton  
Burlington, Vermont



# TORTURING METAL



The whine becomes a high-pitched squeal and both men press hands tightly over plugged ears.

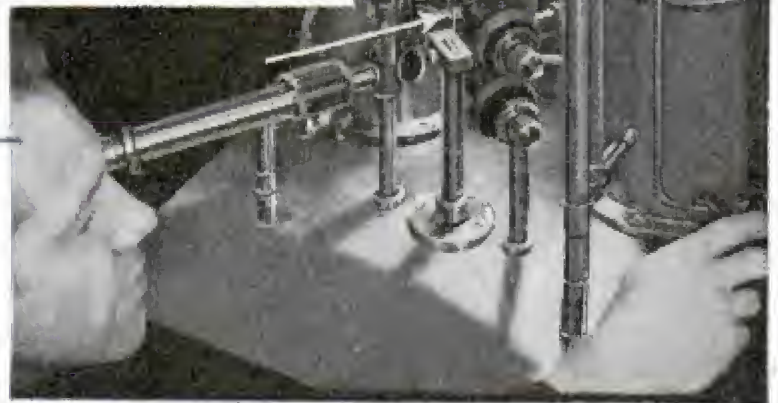
Finally the squeal changes to a piercing, continuous scream as the flywheel reaches a speed of 12,000 revolutions per minute. The bits of metal on its rim are traveling at bullet speed—more than thirteen miles a minute.

Quickly one man removes hand from ear, reaches for a water valve and opens it wide. As the water spurts from the nozzles inside the housing

**I**N a little red brick building atop "Miracle Hill" in East Pittsburgh, a Westinghouse research man hovers over a sturdy motor mounted on a heavy concrete base, its shaft extending into a thick-domed concrete housing. The apparatus looks something like a motor generator. But it isn't.

Opening a window in the housing, he screws two pieces of polished steel, each one-eighth of an inch thick, into the rim of a flywheel on the shaft so they will pass in front of two water nozzles as the flywheel spins. Then he carefully closes and locks the window and steps back.

"Let 'er rip," he calls to an assistant standing at a switchboard. A switch clicks home and the motor begins to hum. Hastily both men fish rubber plugs from pockets and stuff them in their ears. The hum rises to a whine as the motor gathers speed



Electric furnace, top, for measuring "creep" of metal samples. Below, fatigue test machine which can measure strength of human hair. Photographs courtesy Westinghouse

onto the bits of metal the scream becomes a shriek—shrill, inhuman, blood-curdling. Hands over ears the men watch tensely—one minute—two minutes—three minutes. Then one turns off the water. The other opens the switch. The shriek subsides to a moan. The moan becomes a hum. The flywheel stops.

Eagerly the men open the window and



# To Make It "TALK"

Frank Cassin

J. S. Bengelberg

es 1397

detach the metal pieces. Three minutes ago the bits of steel were smoothly polished. Now each has a jagged notch cut almost a quarter of the way through it—a notch cut through steel by water under no more pressure than that at your kitchen faucet.

Here is an astounding demonstration of the power of a little jet of water. But why did they do it?



Machine, top, which cuts steel with water. It sets up an ear-splitting screech. Below, machine with cover removed, and steel sample cut by water stream

Here's the answer. Just as the continuous drip, drip, drip of water wears away stone, so also does the impact of water wear away metal if the force is great enough. Tips of airplane propellers are eroded by coming in violent contact with nothing more than drops of rain and particles of fog. Steam turbine blades whirl at tremendous speeds and, in the low-pressure stages, where the steam contains some water, show this erosive effect after a few years.

But some alloys erode faster than others and Westinghouse turbine engineers wanted to know which ones resist erosion best. So research men built the apparatus which cuts hard steel with a little stream of ordinary drinking water in order to find out. And they not only have a quick check on the relative merits of different alloys for turbine blades, but they have learned many other things. They have found, for example, that the rate of erosion for some metals is not constant as we might suppose. Stainless steel erodes rapidly at first, but the rate decreases gradually until it be-





comes fairly constant. Another alloy does exactly the opposite—wearing slowly at first, then increasing in rate.

Our medieval ancestors had cruel but effective tools for prying secrets from stubborn lips. Torture made men talk, they found, and they used the rack, the wheel and ordeals by fire and by water to loose men's tongues. Torture makes metal "talk," too, men of science have discovered. So today, when researchers want to pry from a stubborn alloy the secrets of its strength and weakness, they do to the metal what the ancients did to men. They torture it to destruction.

Strangely enough, metals are put through the third degree by instruments of torture which inflict on metals the same cruelties of endurance once practiced on men. The test for erosion of alloys may well be compared to the ordeal by water which human beings used to suffer. This ordeal by water

for metals produces better turbine blades and more efficient airplane propellers. Other trials by torture for metals—corresponding to the rack and the wheel inflicted on humans—result in the development of alloys able to withstand the punishment of continued stress and vibration.

Metals, like men, become tired from over-exertion. Bend and straighten your arm repeatedly and eventually the muscles become fatigued. Compress a coil spring and extend it continuously and, after a much longer time, the spring also becomes fatigued. Your tired muscles soon repair themselves but the tired spring does not. This characteristic



*Making tension test, top, on steel bar. Below, shaft and spring tested to destruction, and small shaft which is being turned until it fails*

of metals which causes them to tire under continuous stress, strain and vibration is known as metal fatigue. When the metal becomes over-fatigued, it breaks. Without thinking, you probably have taken advantage of this very characteristic when, lacking a pair of pliers with which to cut a piece of wire, you have twisted and bent it

(Continued to page 122A)



## Two-Motor Transport Has Safe Landing Gear

Among the first of the larger aircraft to be equipped with the safety tricycle landing gear, a new two-motor transport plane has completed test flights. The ship is adaptable for six, eight or ten passengers. "Slots" which function automatically, flaps and ailerons, with the tricycle gear, reduce the landing run and the takeoff run considerably. Powered by two 425-horsepower engines, the transport is a high-wing, semi-cantilever monoplane. It has a top speed of 207 miles per hour at 5,000 feet and a cruising range of about 800 miles. The nose wheel is steerable, being hydraulically controlled. All wheels are equipped



Here is the latest transport about to land on its tricycle gear. Note position of the two motors, with cabin between

with hydraulic brakes. The ship was designed according to specifications laid down by air-line and charter operators, sportsmen pilots and industrial concerns using planes for business purposes.

## Model Stagecoach Is Complete to Candles in Lanterns

Tiny but complete in every detail, a model stagecoach was among exhibits at a

recent show staged by the California Graduate School of Design. Modern industrial design and the historic forces behind it were portrayed. The display contrasted 3,000 years of European development with 330 of American progress to show the need for planning and design. The miniature stagecoach's tiny glass lanterns contain still smaller candles.



Applying brake lever on miniature stagecoach. Note the detailed construction

## Dual Wheel Springs for Bicycle Give "Knee-Action" Comfort

Twin-springing on both front and rear axles of the bicycle is being introduced this year by one manufacturer to add more comfort.

Separate cushioning action on both wheels prevents "galloping" and offers a "knee-action" ride, allowing better control on bumpy roads. The springs can be adjusted according to the weight of the rider.



The Huffman Mfg Co  
Pasadena, Calif.



## Tug Pilot Watches Mirror for View of Tow Astern



Looking in this mirror from wheelhouse, tug skipper can see beyond his own decks to the tow astern

When the skipper of a tug in the harbor of Port Alice, B. C., found he could not see the stern from the wheelhouse, he borrowed an idea from automobiles and installed rear view mirrors. Brackets were attached at both sides of the wheelhouse; the mirrors, about twelve by fourteen inches, are held in with angle clamps and are adjustable to any angle.

## Metal Found in Meteor Crater by Electrical Prospecting

Scientists have found evidence that beneath Arizona's famed Meteor Crater there exist large masses of what may be parts of the meteor. Despite the name of the giant pockmark in the earth's crust, scientists have not been sure that it was caused by a meteor striking at that spot. Yet scattered tiny surface fragments indicated that a meteor, containing ninety-two per cent iron and eight per cent nickel probably plunged into the earth there. New measurements, by electrical prospecting, have disclosed five giant masses of magnetic material, probably iron, lying

1,200 feet beneath the crater. Through the years drilling operations have sought to strike what scientists have thought may be underground iron deposits large enough to bring wealth to the finder. But the fractured underground rock structure and swift currents of underground streams hampered the work. Drilling was abandoned in 1931, but the recent discovery may result in its revival.

## Power Systems Made Safer by Load Calculator

Exactly the load a power system may carry with safety and economy can be determined quickly with a calculator which reproduces a miniature replica of any power system in the world. The device also determines what additional equipment a system requires for expansion of power transmission services. It discovers why, for no obvious reasons, transformers are overloaded and determines means of better controlling the circulation of power. Studies conducted with the calculator have saved power consumers many millions of dollars by enabling the utilities to carry



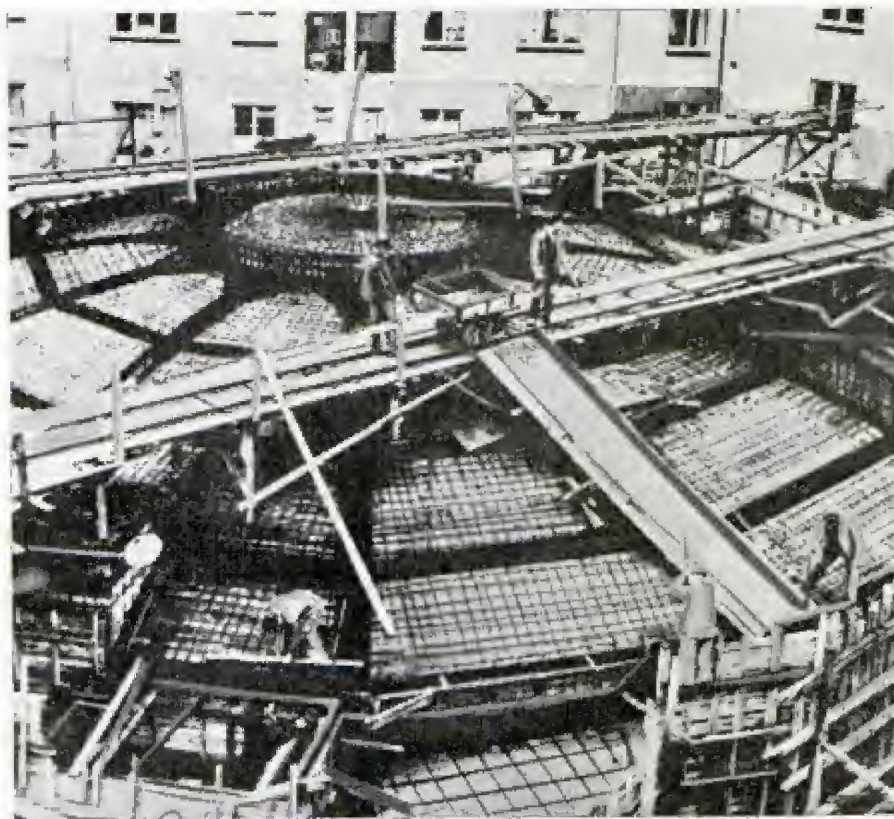
This board permits electrical engineers to reproduce power systems in miniature

Westinghouse



larger loads efficiently, safely and economically without the expenditure of money on unnecessary extra equipment. In a room surrounded by panels like a telephone switchboard, Westinghouse engineers insert plugs, turn dials and bring the electric networks under the microscope of the calculator. The device includes a labyrinth of coils and condensers which duplicate the electrical characteristics of "big fellows" of the power world. Its sources of electrical power are packed away in cabinet drawers. By plugging in on the proper combination of units, the engineers produce a small-scale model of any electrical system, either in actual operation or merely drawn on paper for proposed construction. With the aid of the calculator the engineers solve in two or three days questions that would require several months under the usual methods of human calculation.

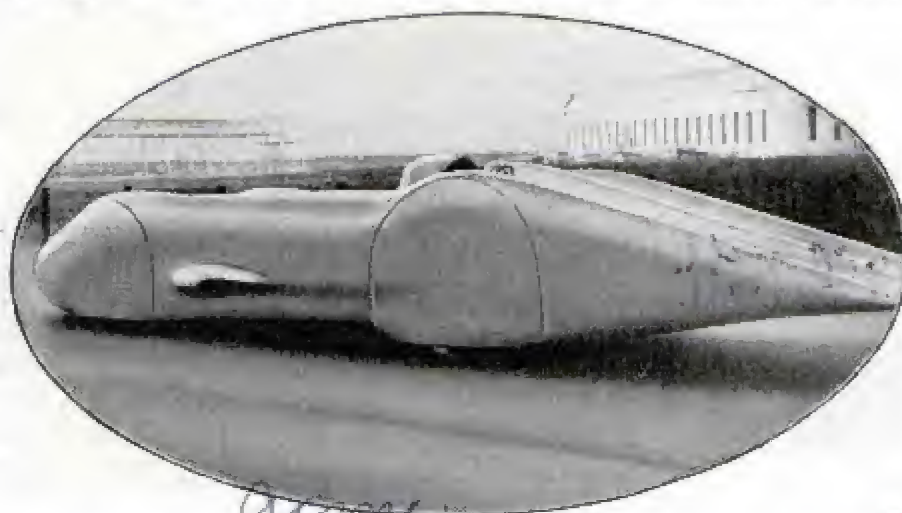
## Underground Movie Theater Has Entrance Like a Subway



Workmen are finishing roof of underground motion-picture house in Hamburg, Germany. It will be entered by stairway leading down from street

Hamburg, Germany, is to have an underground movie house. Its domelike roof of steel-ribbed concrete has already been poured, and when the surface is covered—on a level with first floors of the surrounding buildings—the exterior will be complete. The new theater will have an entrance stairway like that of a subway station.

## Latest Streamline Race Car Sets Records in Germany



This strange-looking vehicle is one of Germany's latest high-speed racing cars, which recently established two records

Its huge power plant housed in a long, streamline body, the latest German racing car has established two new speed records. One was the one-kilometer record, at a pace of slightly more than 270 miles per hour; the other the one-mile record, at a speed of slightly above 273 miles per hour. Both records were set on the German auto track at Frankfort-on-Main.

News - Rudy Caracciolo



Salesburg, Kans

## Gas Tractor 'Jockeys' Old Steamer from Mud



In circle, riding atop boiler of the old timer, is the little garden tractor that drove the big fellow out of the mud

After being abandoned in mud for nine years, a broken-down steam tractor twenty-four years old and weighing 22,000 pounds was driven from its anchorage by a little three-horsepower garden tractor. The 450-pound tractor might not have been equal to the job of hauling the old steamer from the mire by direct pull, but it was mounted on top of the boiler to obtain leverage through the transmission gears of the two machines. One wheel of the gasoline-driven tractor was removed, the differential was locked and the other wheel used as a belt pulley. A belt transmitted the power to the big tractor and drove it easily.

## Rear-Engined "Teardrop" Car Is Designed for Safety

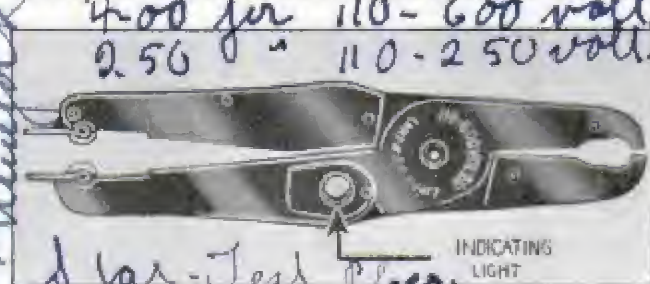
Equipped with many safety features, the latest "teardrop" automobile is driven by a motor located in a rear compartment. The vehicle has headroom of six feet four inches, and a road clearance of ten inches. It weighs 3,800 pounds and has an over-all length of twenty-two feet on a 140-inch wheelbase. The car has electric gear shift, vacuum brakes and a periscope that gives the driver clear vision of both sides and the rear. Stop and signal lights on both sides at the rear revolve when the brakes are applied or the driver desires to signal his intentions. The body construction is aluminum, steel and wood ply. With a cruising speed of fifty miles per hour, the car has attained a top speed



Specially built automobile provides for driver to sit close to the front, giving a wider range of vision

of eighty-six miles per hour in tests. It averages about seventeen miles per gallon of gasoline. The car was designed by Grover Branstrator, well known creator of streamline commercial cars and buses.

## Tiny Test Bulb Mounted on Pliers Replaces Unwieldy Bank of Lamps



With tiny indicator bulb mounted on pliers, one hand can spread contact points and test circuit

In place of the cumbersome bank of lamps ordinarily used for testing electric circuits, an inventor offers pocket pliers carrying a tiny, removable test bulb, the pliers being a handy and safe tool for gripping blown fuses. Circuits of 110 to 600 volts can be tested. The tungsten bulb is mounted on one arm of the pliers, which can be manipulated easily with one hand.

Star June 6  
 235 Canal  
 Branstrator Body  
 118  
 4.00 for 110-600 volt  
 2.50 " 110-250 volt



# Radio-Driven Model Plane Is Target for Guns

Anti-aircraft batteries of the coast artillery are trying their marksmanship with a radio-controlled model airplane for target, and if the test is successful these miniature pilotless ships may be used regularly to train army gunners. A three-horsepower gasoline engine drives the craft, which has a wingspread of twelve feet and is eight and one-half feet from propeller to tail. In the fuselage is a three-tube radio set sending impulses to tiny electric motors which operate the tail, rudder and elevators. On the ground is a short-wave sending set and a control box with contact points by which the operator can modulate the wave lengths of the radio impulses to guide the plane up, down, to left or right.

Motor-driven model plane and the radio control box by which it is guided in flight



## Two-Way Diesel Engine Runs on One to Four Motors

Equipped with four engines that can be operated singly or in union according to the load being hauled, a Diesel-electric switching locomotive achieves both elasticity and economy. Its cab is at the center, and there are two V-type eight-cyl-

inder Diesels at either end. A fifth engine beneath the cab operates pumps and air compressor. The locomotive can handle fifty to 100 freight cars, developing 60,000 pounds tractive effort when the four engines are teamed. If the job requires only

the shunting of a short string of cars, however, the engineer can cut out one, two or three of the 175-horsepower motors and thus save fuel. Provided with dual controls, the locomotive may be driven in either direction with equal ease and need never be reversed on a "Y" or turntable. Each engine is coupled to an electric generator, each generator produces power for four electric motors of which one is located on each of four axles. The engine will have a top speed of about forty miles an hour.



Designed for flexible, economical operation in switchyard, this Diesel locomotive has four eight-cylinder engines which work singly or teamed

Clavenport - Desler Corp





## How FLYING CLIPPERS



Top, conferring on flight. Note weather map. Bottom, ship officers gather weather data

A STRONG west wind at Manila, a storm far at sea, a twenty-mile wind 10,000 feet above San Francisco—unrelated bits of weather information like these govern departures and arrivals of trans-Pacific flying clippers.

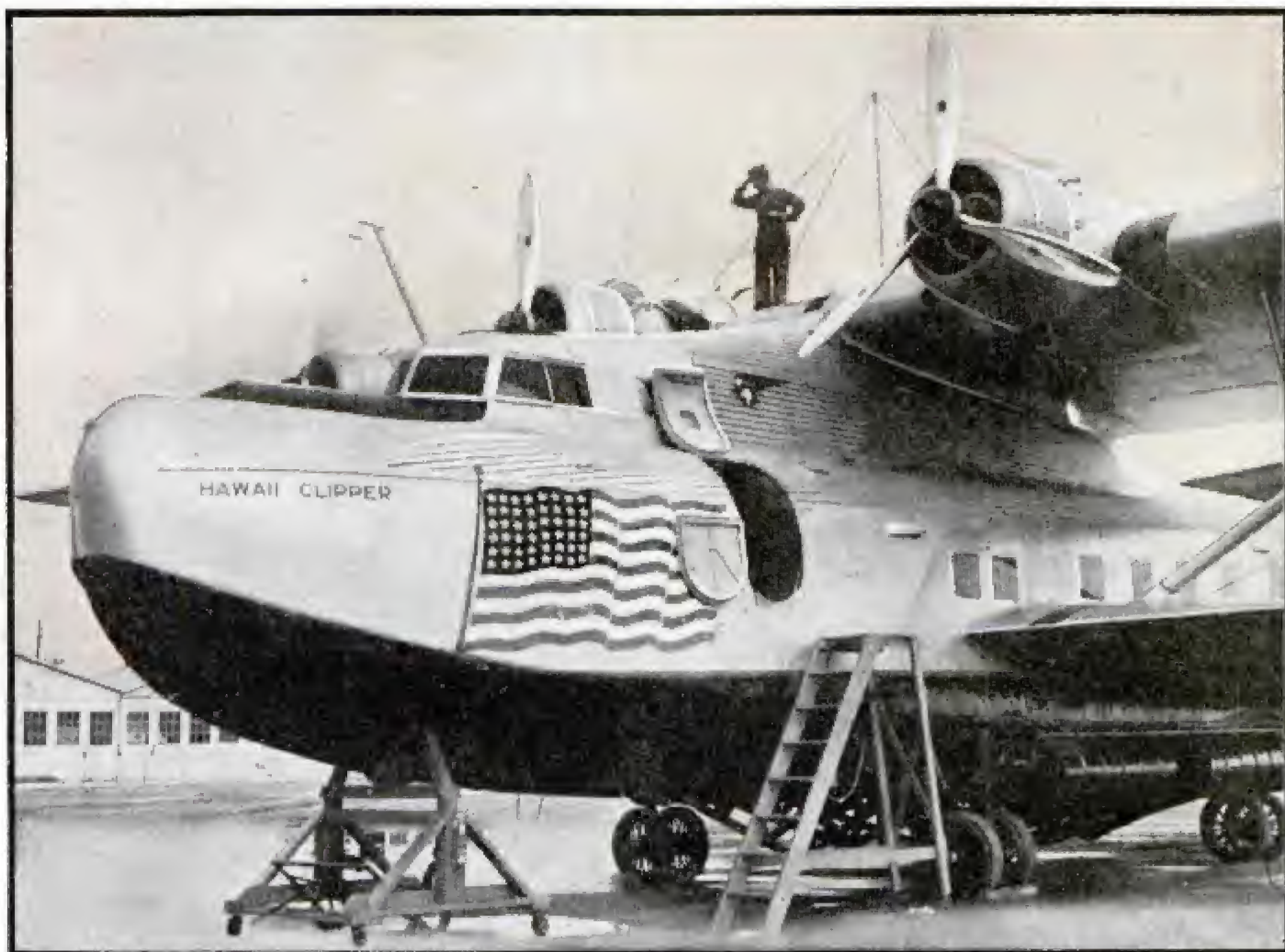
What the weather happens to be in Hawaii influences the hour at which one of the big flying boats will leave its base at Alameda on San Francisco bay. The weather regulates the amount of cargo that the plane can carry and even fixes the hour that it will arrive in Honolulu.

But far from allowing the weather to run the airway, Pan American's meteorologists have almost reversed the process. Instead of running the weather, they have put it to work. By getting an upper hand on the elements they are able to maintain transoceanic flights as regular as steamship schedules. No matter in which direction a plane is bound they usually find a tail wind to boost it along.

*Carl Thomas & J. J. Thomas Jr.  
10556 Hollywood Ave.  
Los Angeles, Calif.*

*Western Pacific*





# DODGE STORMS

There is always rough weather somewhere on the Pacific. On the 9,000-mile airway to China there is hardly a day when the weather everywhere is perfect. Instead of waiting for storms to die down the meteorologists have worked out ways of putting them to use. So competent have they become that during the past year Pan American has lost the equivalent of only one round trip in delays due to weather.

At Alameda the Pan American Airways Pacific division meteorologist outlines the way that the clippers take advantage of the elements. On the desk in front of him he has a large map on which storm centers and wind directions on all parts of the Pacific have been marked. He has just finished the forecast and flight-time analysis for the last leg of Trip 160, the Honolulu-Alameda jump marking the completion of the eightieth round trip across the Pacific.

"Data for this map were gathered at four o'clock this morning," the meteorologist



Top, inspection before flight. Bottom, releasing balloon to study wind direction and speed

Reference: William Clover, Chief Meteorologist Pan American

*Pan Am  
Alameda  
Air Line  
Pan American  
Alameda*





explains. "The clipper will not leave Honolulu until two o'clock this afternoon but already we can tell what the weather is going to do in the meantime and what the conditions will be while the plane is in the air.

"It's 2,400 miles to Hawaii. Over such a long distance one might usually expect to encounter a storm or strong head winds. So there are three alternative routes that the clippers can fly. First is the short great-circle route used by steamships. Next is a northern route, 250 miles longer, that takes the clippers considerably north of the steamer track. Then there is the southern route, also consisting of two legs, on which a San Francisco-bound clipper flies directly toward Mexico for half the hop, then heads up toward its destination.

"On today's map here you can see a high-pressure area centered about half

way between the coast and the islands. There's a twenty-knot east wind blowing toward Honolulu from the storm center. That means head winds half way across and the chance of running into rough weather on the direct great-circle course. On this direct route, figuring from the present weather conditions, today's flight would require twenty-two hours.

"But north of this storm center we find some arrows showing a westerly wind with speeds of up to twenty-six knots. That means a tail wind instead of a head wind. Obviously, we are routing the eastbound clipper over the northern route. The boat will fly 250 miles farther and get here quicker.

"Continuing this analysis of the weather, the wind flags on the map indicate that at 4,000 feet the



*Top, steward checking supplies and baggage while mechanics inspect clipper engine at Midway island. Bottom, radio operator at Alameda base*

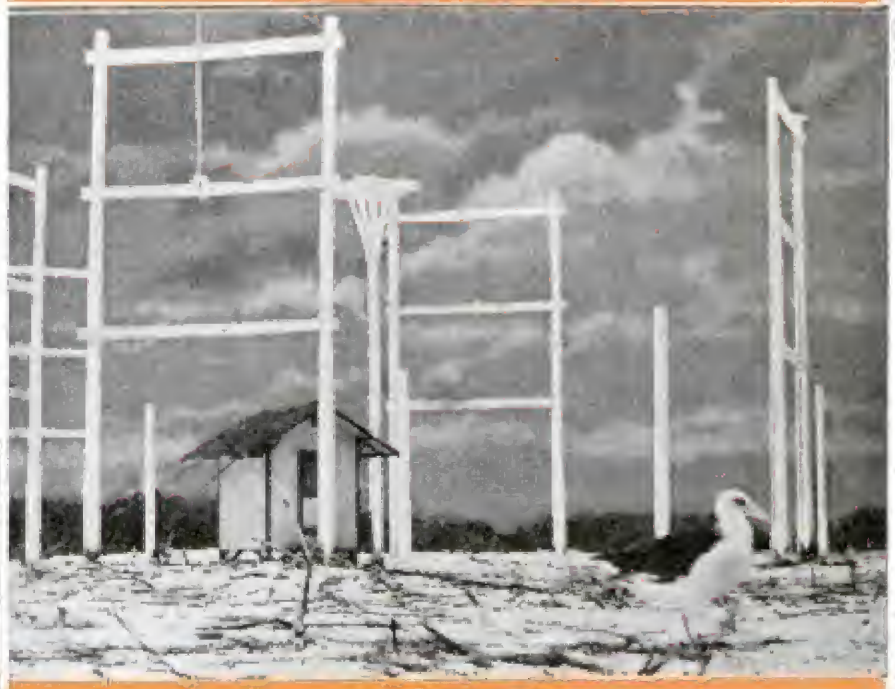
flight will take 19.9 hours. At 7,800 feet better winds would cut this time by an hour and a half. At 11,500 feet there are even stronger tail winds, permitting a flight of only 17.8 hours. But because of passenger comfort in the thin upper air the flight is going to be made at 7,800 feet. That will permit a saving of three and a half hours over the time possible on the shorter direct route. Incidentally, because less fuel



will have to be carried to fly the longer distance, about three-quarters of a ton more payload can be carried."

If there were a west-bound flight due to leave San Francisco at the time this map was drawn, the plane also would have a fair wind under its tail even though it were going in the opposite direction, because the chief meteorologist would route it over the southern course where the map shows a strong east wind, there being a 180-degree difference in the wind track direction around the central high-pressure area. Each route is divided into four zones and the details of the weather in each zone are analyzed for the captain of the departing clipper.

This smart way of anticipating the weather and putting it to work is



Meteorologist preparing flight plan after studying weather indications

Top, copying radio message from clipper. Center, aeriels of Midway's direction-finding station

based on analysis of the major air masses that control the Pacific weather. The chief meteorologist and his four assistants at Alameda draw maps every day that show the weather at every point on practically half of the northern hemisphere, from ninety degrees east longitude to ninety degrees west longitude and from the equator to the arctic circle. They make forecasts covering the airway as far away as Guam, 6,000 miles to the west, up to thirty-six hours in advance. Three men at Manila prepare similar forecasts covering the

(Continued to page 142A)



# Surfboard Sail Puts New Thrill in Old Sport

Sailing on a surfboard is the newest of water sports. From the crude sport of riding the waves on makeshift boards, surf

riding has gained in popularity and "science" with the refinement of the board; it has grown longer and narrower, new woods

have been introduced, lighter for their size, and hollowed out in the center to make them more buoyant and manageable. The larger boards are from fourteen to twenty feet long and weigh as much as 130 pounds. Now Tom Blake, outstanding American surf rider, has started a new style by mounting a mast and sail on his board. It takes skill, but adds fun to the ride on the rollers.

Off for a sail on a surfboard! Close-up at left shows how the mast is made fast to the board



## Building Brick in Many Colors Made from Same Clay in Same Kiln

Made from the same clay in the same kiln, building brick of many colors is being produced by a process called "flashing." Theoretically, all that is required is to generate the proper vapors in the firebox of the kiln and to keep these vapors

in contact with the brick long enough for the complex chemical reactions to take place. The best flashing results are obtained at extreme temperatures. Various chemicals are placed in the firebox, but the most varied and pleasing effects are

Authority - George C. Betty Ceramic

Tom Blake  
431 Poplar  
Hawaiian Islands  
Hawaii  
Selling  
11/1/30

Summer St.  
16th Ave



obtained with zinc. It is not uncommon to see a blending of rich greens, purples and violets, with warm shades of brown, tan and tangerine coming from the same kiln. Temperatures usually above 1,800 degrees Fahrenheit are required and 200 to 300 pounds of zinc are needed to color 50,000 to 80,000 bricks. The green color imparted by zinc becomes more vivid upon exposure to the weather and some plants wash the bricks with a stream of water as they are taken from the kiln. Copper has been used to give brick a bronze or coffee color. Here the temperature must be above 1,900 degrees to get the best results.

#136.

### Simple Gas Gauge Tester Checks for Accuracy

Accuracy of the gasoline gauge in the modern automobile is checked easily with the aid of a simple testing unit developed recently. The instrument, which tests only electric gauges now used as standard equipment on about ten million cars, checks both the instrument panel indicator and the tank equipment in determining whether the gauge is registering the exact amount of gasoline in the tank.



Checking accuracy of gasoline gauge. Inset, simple equipment for making the test

AC Sparkplug Div.  
General Motors Div.

## Bombing Plane Carries Sting in Both Its Tail and Its Nose



Twin-engined bomber of the British Royal Air Force in flight, and a close-up showing the bombing cockpit under the rudder

Britain's latest bombing planes carry a sting at both ends. Named the "Wellington I," this twin-engined warplane of the Royal Air Force has extra bombing cockpits in the nose and in the tail, the rudder being mounted above the latter. The new plane is of the midwing monoplane type.

#134.

### Friction Tape Clipped to Belt Is Always Ready for Use

Worn on the belt, a reel and clip for holding friction tape keep the tape at the finger tips, ready for instant use. The reel snaps on to the clip, preventing loss of the tape and assuring that it will be used to the last inch, for the roll is not thrown away when it becomes too small for handy use.

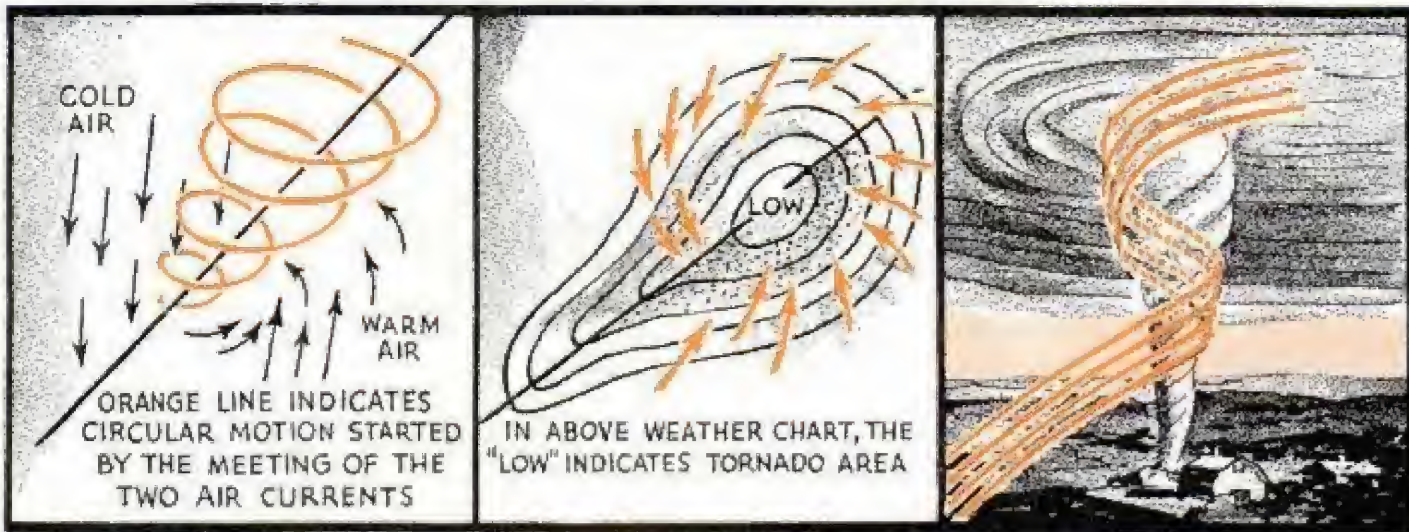


Adel Path.

Ideal Commutator  
Dresper Co 5053-111



# TORNADOS *are* HIS



Top, how tornado forms and how it appears, with orange lines denoting the whirling motion. Bottom, weather observer studying tornados

*S. D. Flora*



*Jokeka (2)* A DENSELY black, funnel-shaped cloud whirling out of the west with the roar of a thousand express trains—that is a tornado.

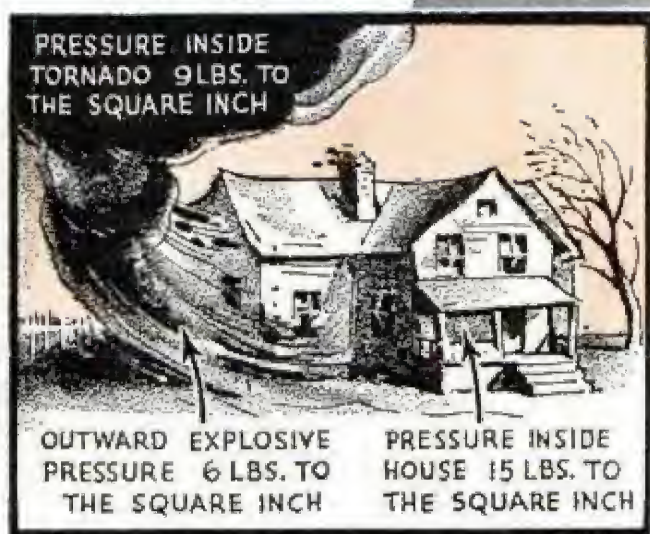
It is the master devastator. Not even the West Indian hurricane can compare with its concentrated fury or destructiveness. You can take S. D. Flora's word for it. Thirty-five years a meteorologist of the U. S. Weather Bureau in Kansas, he has had ample opportunity to examine evidences of its violence.

Tornados are his specialty, a hobby he has followed in and out of office hours. Although an expert on the subject, he has never seen one. On one or two occasions, a tornado passed within a few miles of his office but he did not hear about it until the show was over.

However, in the wake of these whirling clouds that resemble giant, weaving elephants' trunks, Flora has seen locomotives that had been lifted from their tracks, wagons in tree tops, skeletonized buildings,



# HOBBY



*Above, showing how house literally "explodes" in tornado. Right, remarkable photograph of an approaching tornado*

*W. Eszembury  
Kans.*



uprooted trees, and many other exhibits of havoc.

When a tornado struck a southern Illinois city a few years ago, the weather observer relates, a hard-pine pole was driven completely through an eighteen-inch poplar tree. Into the trunk of another tree a two by eight plank was driven more than eight inches by the force of the wind. So firmly was it imbedded that the protruding end was strong enough to support a man's weight.

Chickens have been stripped of their feathers and there is record of at least one hen miraculously surviving such a catastrophe. Straws frequently are blown with

such force into doors and fence posts that they stick out like whiskers.

Several years ago the railroad station of Elmont, Kans., was wrecked. Flora found the window of the ticket cage several blocks away from the depot site with a heavy scale resting on it, but the glass was unbroken.

A tornado generally travels from southwest to northeast at a rate of forty to fifty miles an hour, and can be outdistanced by a motorcar. Unaware of this, a motorist near Topeka, Kans., last summer abandoned his car and ran for cover in a schoolhouse when he saw an ominous cloud approaching. The school door was





locked so he dived into the coal shed in the rear of the building. A moment or two later, the tornado struck. His car was blown off the road, the schoolhouse was reduced to kindling wood but the coal shed remained intact and the fortunate motor-car driver was unhurt.

Tornados do not follow any hard and fast rules of conduct. Sometimes, they touch the earth for only a moment, other times, they travel 300 miles or more, hitting here and there and then disappearing into space. Their path of destruction may be only twenty-five or fifty feet wide or it may be one-half mile. As a rule, their course is about a city block in width. Whole blocks of city homes have been wiped out by these storms while residents in other sections went about their business unmindful of what was happening.

Regular business hours for the tornado are between 2:00 and 6:00 p.m., Flora's records show, but the greatest disaster in recent years, the 1936 storm at Gainesville, Ga., in which 203 persons were killed and \$13,000,000 worth of property destroyed, occurred at 8:30 a.m.

April, May, and June are the peak tornado months and during the past twenty years, the annual total for the United States has varied from sixty-five in 1919 to 260 in 1933. Death toll reached an unprecedented high of 794 persons in 1925, the year in which the most destructive tornado in history swept over an unusually long path across Missouri, Illinois, and Indiana.

If the ferocious spiral has a virtue, it is the shortness of its life. While a hurricane may last for days, the tornado rarely goes beyond the hour limit. However, this is small comfort when you consider one swept across St. Louis in 1927, killing eighty-five persons and injuring 1,300 and chalking up \$15,000,000 worth of damage, all in the space of five minutes.

The air making up the elephant's



*Top, auto wrecked after being carried several blocks by tornado. Bottom, entrance to tornado cellar, commonly known as cyclone cellar*

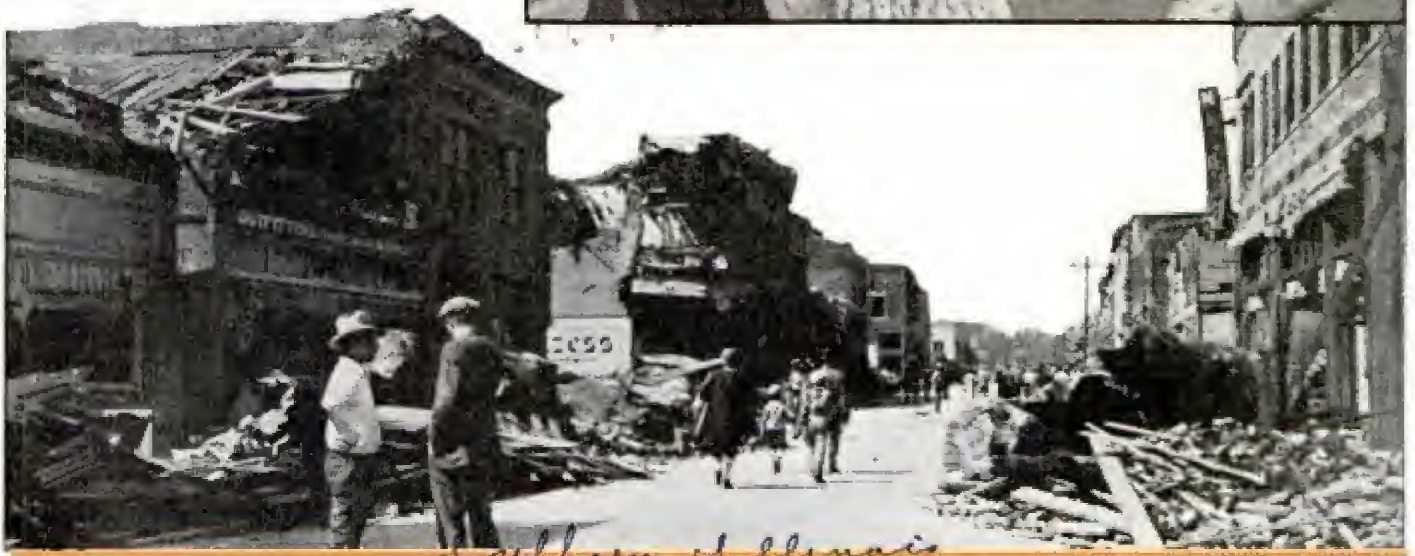
trunk whirls at high speed, variously estimated at between 300 and 500 miles per hour. No instruments rugged enough to withstand the wind's terrific force have ever been developed to measure this velocity accurately. In the center of the spiraling cloud, pressure is reduced by the centrifugal force of the whirl. A partial vacuum is created, which may be compared to the whirlpool forming when the plug is pulled out of a washtub except that here the motion is inverted. The partial



vacuum accounts for freakish performances of the tornado.

"In order to understand this," says Flora, "we must recall a few facts about atmospheric pressure. The ordinary pressure is around fifteen pounds per square inch, or approximately one ton to every 144 square inches. We know the reason our houses do not cave in is because there is an equal amount of pressure on the inside as well as outside.

"When the vacuum-like cloud envelops a building, pressure on the outside is reduced. Inside it remains the same. Consequently a higher pressure exists indoors than outdoors so that windows and walls are forced out-



Top, pine stick driven through trunk of tree by terrific force of a tornado. Bottom, business street of a Missouri city after it was struck by the tornado

ward. In other words, a building literally explodes. It's the same effect that is produced by firing off a charge of gunpowder in a closed room."

The condition giving rise to a tornado is described in weatherman's language as a state of unstable equilibrium in the atmosphere. In one-syllable words, Flora says it is brought about by hot, moist air being overrun with cold air. Being lighter

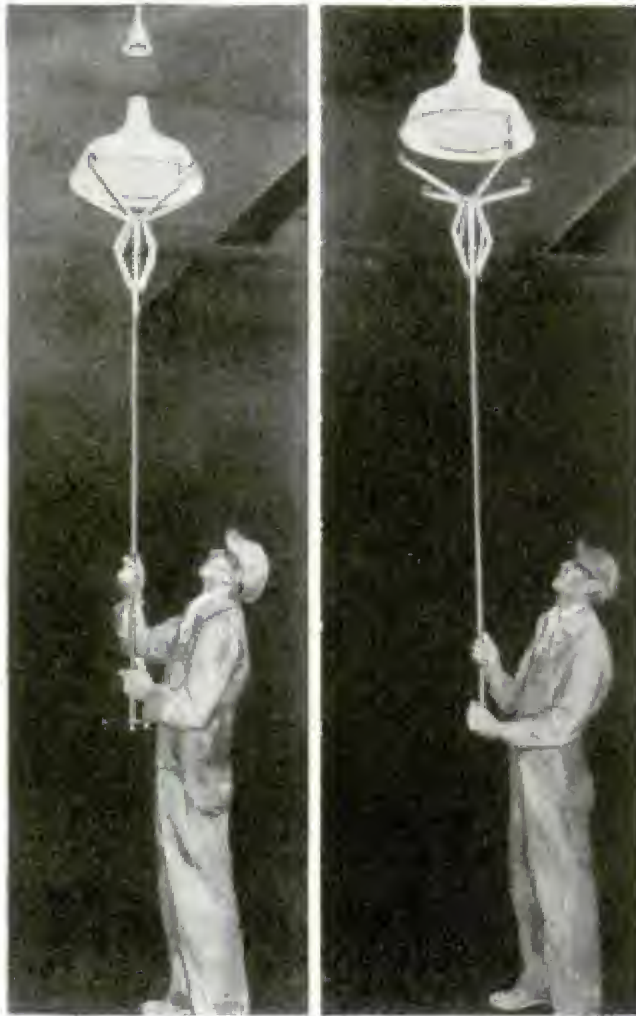
than cold air, the warm air starts to rise and the cold air comes down. When this occurs the whirling motion begins; it is a matter of scientific fact that a vortex forms whenever moving fluids or gases start traveling up or down.

As the moisture condenses, heat is added to the warm air, making it still warmer and causing it to rise still faster. And the

(Continued to page 120A)



## Four Fingers on Long Shaft Install Ceiling Light



Light fixture is thrust into hood and locked by bayonet coupling, then jaws are released by crank

By means of a long shaft with jaws that are adjustable by a crank at the bottom, ceiling light fixtures can be removed and replaced quickly. Globe and reflector as a unit slip into a ceiling socket. The bell-mouth hood and reflector are locked together by a three-point bayonet coupling, and both electrical and mechanical connections are made with engagement of the bayonet lock.

## Rolling Shutters in Air Tower Guard Tunnel from Smoke

Rolling shutters of aluminum stand guard in the ventilation tower of the new Lincoln Tunnel at New York, ready to protect traffic in the tunnel from smoke in the event of a near-by fire. The tower was necessary to furnish a constant flow of fresh air throughout the tunnel. Its fresh-

air inlets are equipped with aluminum louvers and screens to prevent an inrush of snow, sleet, rain, birds or insects. There was danger, however, that the fans might suck in smoke if a fire broke out in the neighborhood, polluting air in the tunnel and causing suffocation or traffic accidents. The rolling doors were therefore installed so that they can be closed singly or in unison by electric buttons.

## Punch for Opening Milk Cans Is Adapted to All Sizes

Sanitary and safe, a kitchen tool for punching holes in milk cans is adapted to cans of standard, tall or short size. It consists of a strong wire which has "steps" at intervals to hold cans of various sizes. At the top is a hook-shaped punch, which punctures the can when the handle is raised.



## Flag Signals to Stop Irrigation When Water Raises Float

To save himself steps in irrigating his fields, a California farmer has devised an automatic signal that unfurls a flag when



Signal arm drops into horizontal position and flag unfurls when irrigation water raises its float

William L. Jacobs,  
California Civil

Kenneth M. Jacobs,  
California Civil

Benjamin Jacobs  
Los Angeles  
H 77  
H 189  
H 150  
H 142  
H 1637 W. Cowley Road  
Beach, Calif.



Mr. J. H. Anderson  
921 Calaveras St.  
Altadena, Calif.

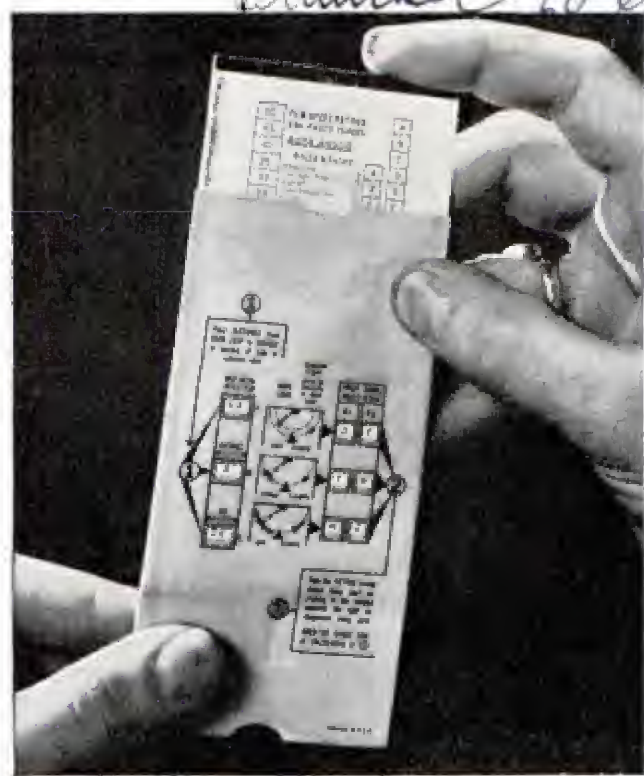
it is time to turn off the irrigation flow. Several of these signals are placed at the low ends of the fields to be irrigated. A hollow post, five feet tall, is mounted on a galvanized-iron box containing a copper float so arranged that when irrigation water reaches it and lifts the float an inch or so, a signal arm springs into horizontal position and the flag unfurls. The farmer, a half mile away, knows it is time to direct the water to another part of the field. The signal saves him the long walk down the field and back. At night a red light is used as a signal, operated by storage battery.

H/4.

### Photography Calculator Gives Floodlamp Data

Inexpensive and easy to operate, a small calculator helps amateur or professional photographer take pictures under floodlamps. It shows properly balanced lighting and correct exposure, insuring the operator of good results. Diagrams on the calculator suggest arrangement of floodlamps.

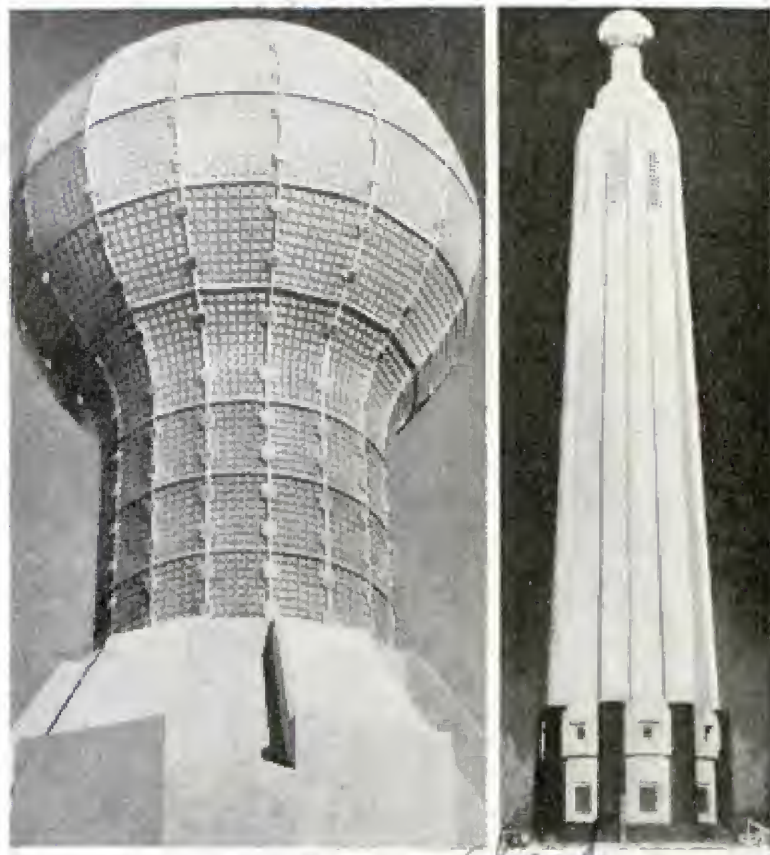
brancher 100



This handy calculator helps the amateur or professional take photoflood pictures

Mundel Electrical Co.

## Giant Edison Memorial Tower Is Topped by Three-Ton Light



Left, close-up of giant lamp which will top Edison memorial. Right, view of the 131-foot memorial tower

Erected at the spot where the original laboratory of Thomas A. Edison stood when he invented the first practical incandescent electric light, a 131-foot memorial tower has been completed. It is surmounted by a giant electric-light bulb containing some 6,000 pounds of glass and 6,000 pounds of steel framework. Made in 153 pieces, the bulb is fourteen feet high.

H/19/

### Garden Hose Sold in Package with Hand-Slot for Carrying

Garden hose is being sold this year in a package designed both for attractive display purposes and for convenience, for it has a handhole in the center for carrying. The metal-edged container is so arranged that the hose can be inspected without damaging the package.



United States Rubber Products Co.  
Inc. 1237 Buchanan St.  
Pittsburgh, Pa.



## Tenderness of Peas Tested by Blade Linked to Dial



Testing peas for tenderness. Dial measures force required for knife to cut through sample of peas

To be sure that canned peas meet the standards required, a machine for testing their tenderness has been developed. The sample being tested is placed in a hopper, and as a blade cuts through them the needle indicates on a dial at the top the amount of force required to shear the peas. This measuring device is intended for use in canning factories.

## Airplane Is "Weighed" in Flight to Tell if Cargo Balances

Continual watch on the balance of an airplane during flight can be kept by the crew by means of an instrument adopted recently by some leading air lines. Distribution of the express and passenger cargo and of the fuel load on long and short flights must be figured carefully to keep the big ships properly balanced throughout the trip. In using this balance computer, the empty weight of the plane and the weight of the crew are determined in

advance, the instrument is set to correspond with these known weights, and constant check can then be kept of the center of gravity as fuel is consumed or cargo shifts position. The pilot consults the instrument before arranging distribution of new cargo at an intermediate stop.

## Straight-Knife for Cutting Cloth Follows Pattern Accurately

Highly accurate cutting, without leaving ragged edges, is achieved by a straight-knife cloth-cutting machine just introduced to the clothing industry. It is simply constructed and durable, with a guide lamp over the blade.



## Loudspeaker System at Track Announces Race Results

Results of races and other information for spectators at Santa Anita race track in California are announced with the aid of a system of loudspeakers. Several large public-address 'speakers, mounted on a vertical standard, carry the announcer's voice to every part of the track and stands.



This multiple-speaker system carries announcement to all parts of race course

*Librascope Balance Computer*

*off-machine of Blue*

*Meredith Industries  
C. A. Galewood, Calif.*



# PHOTOS TAKEN from BALLOONS help solve traffic tangles

**L**ONG used as "eyes" of warring armies, the captive balloon is being drafted by traffic engineers to help solve their problems. At Milwaukee, Wis., during the last few months, experiments in the use of aerial photography have been conducted for the purpose of perfecting a new technique in obtaining traffic layouts of actual field conditions. The goal is to produce flat photographic scale layouts of intersections and traffic areas with the aid of pictures taken directly above the intersection. The equipment employed

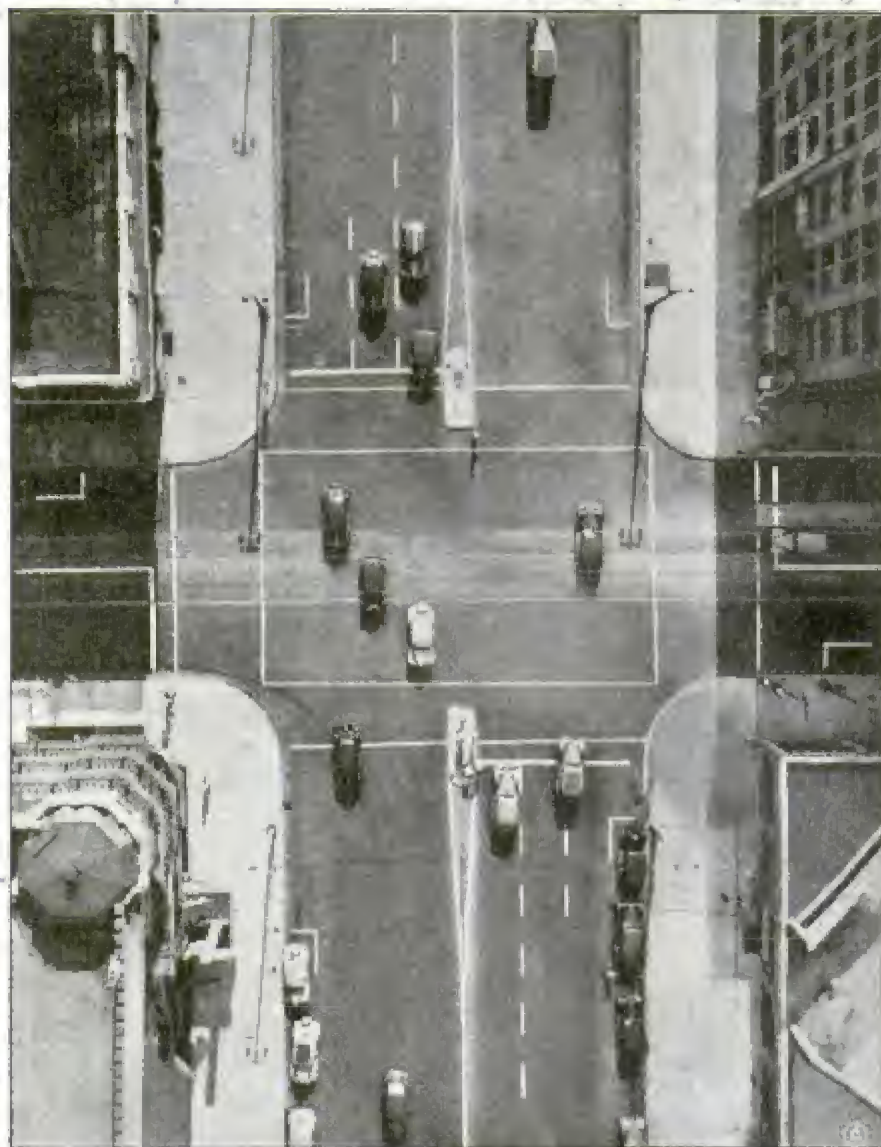


Milwaukee Journal photos

Top, adjusting camera before sending balloon aloft.  
Bottom, balloon carrying camera above an intersection to take pictures

is a captive balloon from which a camera is suspended. The balloon is positioned above the intersection by using a guy rope. By means of a push button in a battery circuit from the ground to a solenoid shutter release on the camera, the plate in the camera is exposed by remote control. Electrical impulses to the camera shutter are conveyed by the guy rope, which also is a two-conductor cable. The camera is so attached that its downward focus is assured while in flight. Best road coverage is obtained, according to Carl V. Bergstrom, traffic engineer, when the balloon is flown at a height of about 300 feet. The balloon can be operated under ordinary weather conditions with a wind velocity up to ten miles per hour. Used in the latest experiments is a camera, number 33A, five-by-seven view model, equipped with an anastigmatic lens of five and one-fourth





ment with auto and small trailer, take one picture every fifteen minutes, or thirty-two pictures in an eight-hour day. To make thirty-two drawing layouts, with which traffic studies previously were conducted, at considerably greater expense than that for which the balloon camera can be operated, would require the time of two draftsmen working ten to fifteen days. Plans in Milwaukee and Milwaukee county call for photographing all of the 100 active intersections in the county. A new camera is being designed to use a special wide angle lens which will give approximately a ninety-degree angle of coverage consistent with good definition. This camera will be equipped with a mo-

inch focal length and f.4.5 aperture rating. This lens normally covers a four-by-five area, but when used with a five-by-seven plate it acts as a wide angle lens, taking in more area. The shutter is operated at  $\frac{1}{200}$  of a second to stop all camera and traffic movement. Twelve feet in diameter, the Goodyear-made balloon has a 900 cubic-foot hydrogen gas capacity. After deducting weight of camera and equipment, the balloon has a surplus lifting power of twenty-five pounds. Ground control equipment consists of batteries, button control for the camera shutter, a checking meter and a large reel for winding the balloon cable, all contained in a convenient box. Two men, handling the balloon and other equip-



Milwaukee Journal photo  
*Top, typical photo of street intersection clearly shows traffic conditions.  
 Bottom, balloon attached to small trailer for easy transportation*

tor-driven gyro to maintain vertical stability while in the air. This will act as a positive means of centering the picture on the negative. Traffic Engineer Bergstrom finds photographs made with the balloon camera quickly reveal potential hazards to motorists, enabling him to call for changes which will solve the problems by eliminating dangerous factors.

Taken at N. Third St. and W. Johnson St.



# Man's Conquest of Air Dramatized in Pageant



On a stage at one end of an arena vast enough to exhibit four seaplanes and a sky liner, man's conquest of air was dramatized at the 1938 aviation show in Chicago. Blinking lights simulated motion pictures while dancers performed routines representing great moments of aviation, from feeble attempts in pre-motor centuries to flights of Wright, Bleriot and Lindbergh. Such events as Bleriot crossing the English Channel were dramatized by miniature planes gliding down a wire across the amphitheater



Ref: Dr. Gerald Cooksey Radiation Laboratory U of California Berkeley

60. 10555 Holman Co. Los Angeles Calif

# PUTTING the ATOM to



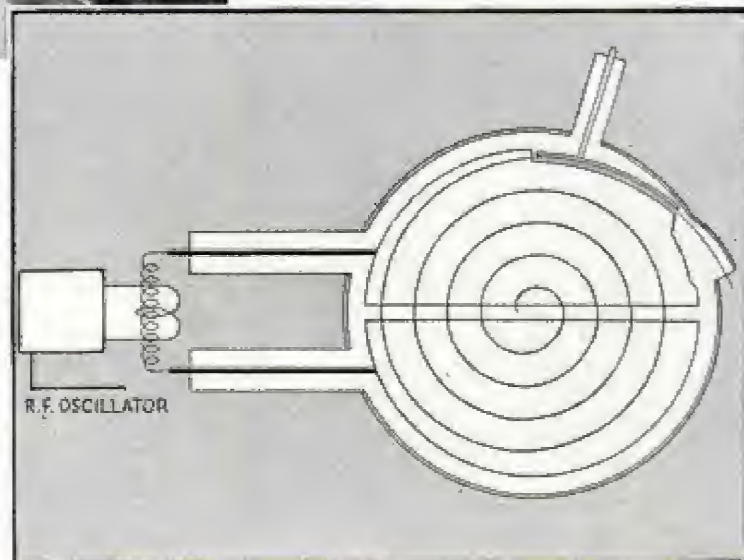
able to create synthetic radium and to produce temporary radioactivity in any element. In some cases these elements can then be used as radioactive food, providing "tracers" by which the transformations of food inside the body can be followed and studied. Such work may provide solutions to many of the puzzling questions that perplex biologists and doctors. Powerful new rays are being released that have far greater destructive power than X-rays. When some of these rays can be controlled it is possible that they will replace expensive radium in the treatment of disease. Actual transmutation of one element into another can be accomplished easily, although so far in only sub-microscopic quantities.

In the radiation laboratory of the University

FOR a long time man has been wondering whether he ever would be able to take the atom apart and harness its energies. Today, in a dozen laboratories, scientists are doing that, but the atomic power that they are releasing is not likely to perform the world's work. So far its usefulness seems to lie in other fields.

"Actually, smashing the atom is leading to things far more important to humanity than simply providing a convenient source of power," states one physicist. "It is becoming a valuable aid to biology and is providing powerful rays to study cancer and other ailments."

By juggling parts of atoms scientists are

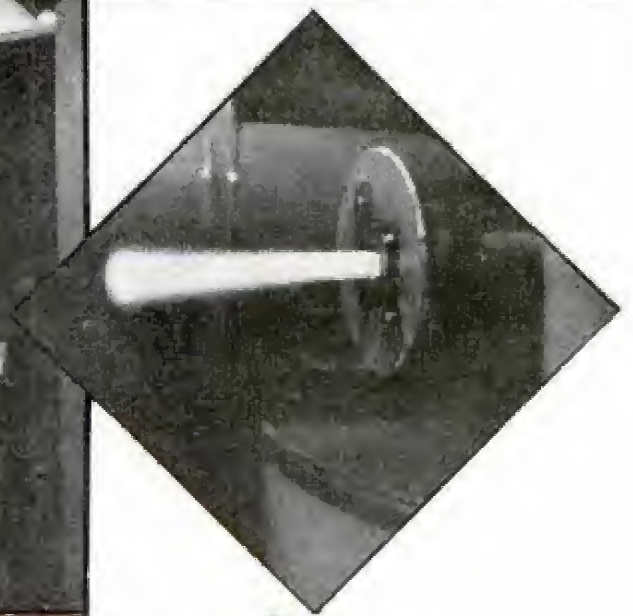
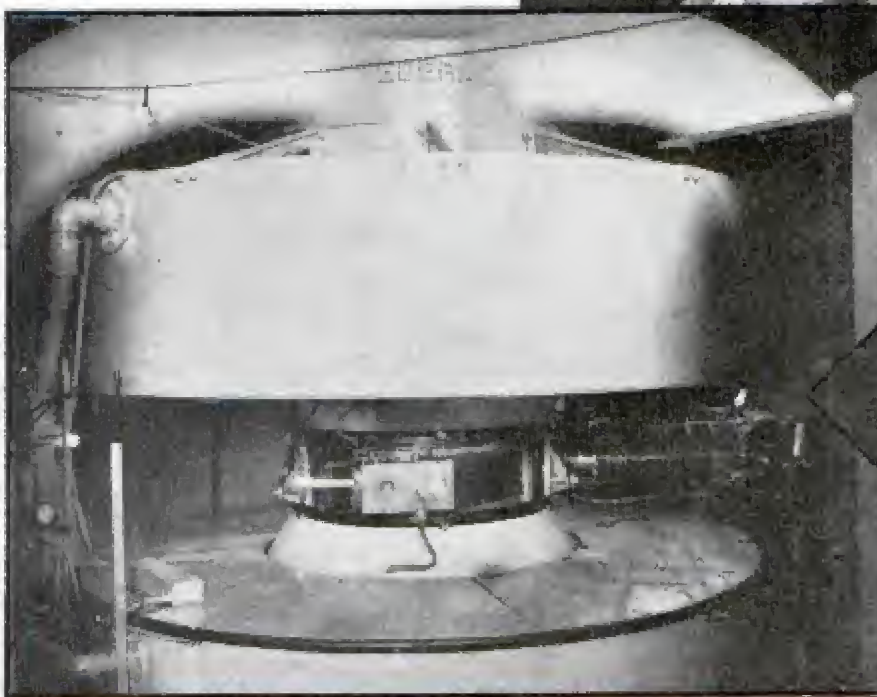


Top, cyclotron's vacuum chamber. Bottom, diagram of cyclotron, representing a cross section of the vacuum chamber which fits between poles of magnet



# WORK

of California at Berkeley, where Dr. Ernest Orlando Lawrence and his staff are exploring beyond the outskirts of knowledge, elaborate precautions have to be taken to prevent over-exposure to the invisible, lethal, and possibly unknown rays they are creating. The eighty-five ton atom-smashing cyclotron which Dr. Lawrence invented is literally submerged in a submarine vault. It is surrounded by walls of water three feet thick to stop or slow down the rays that it generates. Lead shields are almost useless. A thick roof of water above the cyclotron protects workers on the floor above from the effects of the rays, some of which are five times more powerful than



**Top, half-million volt static machine being tested for transmutation of elements. Note hair of worker as he approaches machine. Bottom, cyclotron in action. Note beam at right**





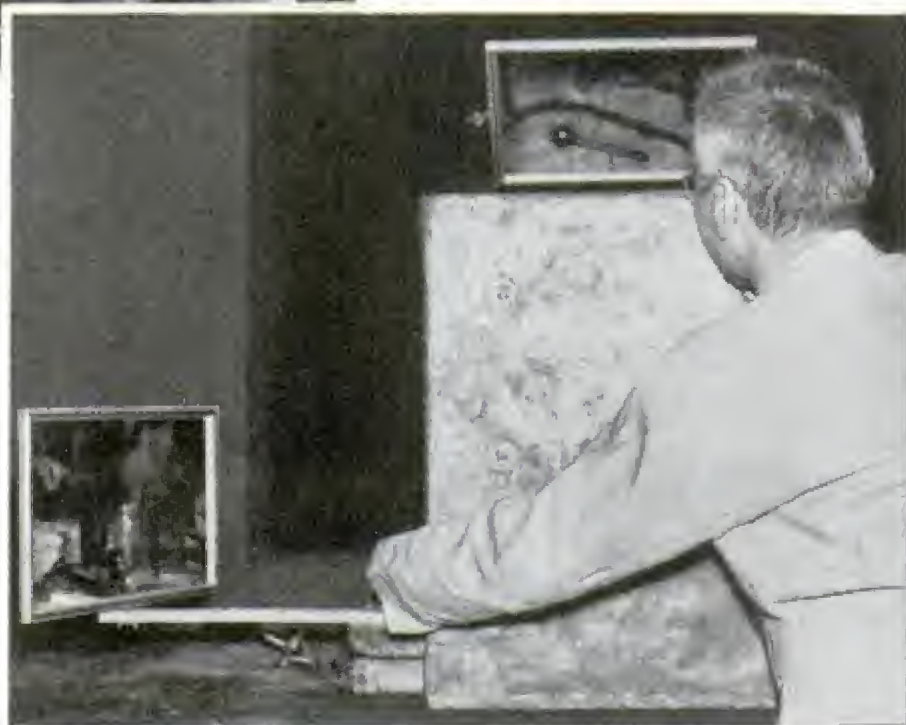
X-rays. Control panels of the machine have been moved sixty feet away and as a final precaution every member of the laboratory staff carries an electroscope in his pocket to measure his "daily dose" of rays.

When the cyclotron is operating, an eerie beam of blue light flames through the air from the small metal door of its snout. This radiance is created by the countless atomic particles that emanate from the machine and crash into air molecules at speeds of thousands of miles per second. The beam is a visual warning of the destructive forces that are present. Photographs of the weird display are made by standing outside the protecting wall of water and aiming the camera at a mirror placed in a window.

"So far, about all that we know concerning the atom might be called merely

a reasonable explanation," one of the physicists says. "The largest atom is only .00000001 of an inch in diameter and many are much smaller. You can think of an atom as consisting of a nucleus made up of bundles of positive electricity, called protons, and a number of particles without any electrical charge called neutrons. Around this nucleus revolve electrons, tiny bits of negative electricity that balance the total positive charge of the nucleus. An atom is electrically stable."

One amazing thing about atomic physics is the results accomplished and the things scientists are able to do with atoms when the particles they deal with are so small as to be beyond human comprehension. If a baseball and an electron were to be simultaneously mag-



*Top, heavy lead case in which radioactive elements may be carried safely. Bottom, radiation worker protected behind heavy lead shield while he watches through mirrors to direct his hands in handling small quantity of salt made radioactive with cyclotron*

nified until the baseball became as large as the earth, the electron still would be too small to be seen under a microscope.

A few years ago the atom was often compared to the solar system, with the electrons revolving like planets around the central nucleus. The more up-to-date idea



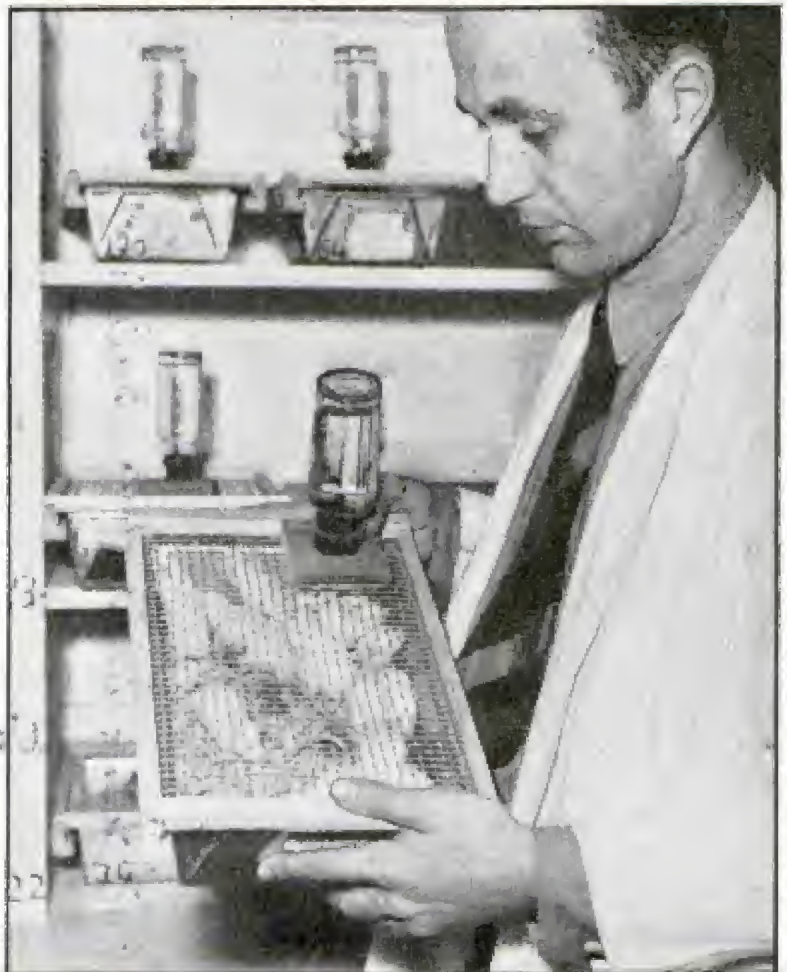
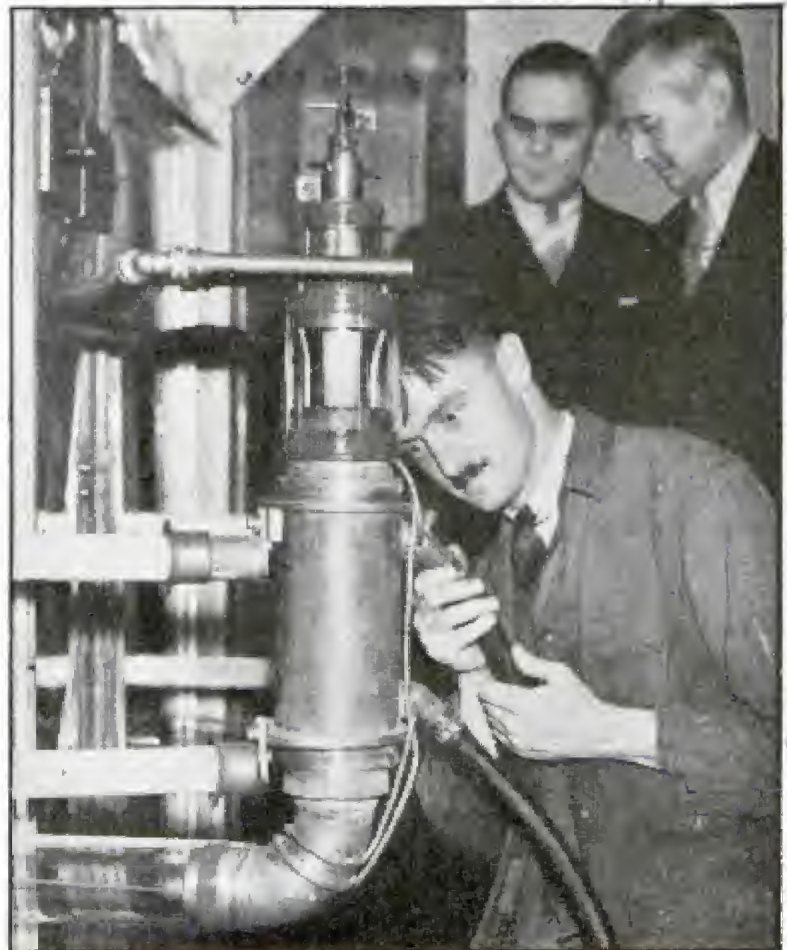
suggests a diffused orange-shaped cloud of electrons spinning about a pin point in the center that represents the nucleus.

The difference between an atom of one element and an atom of another lies in the mathematical combination of protons and neutrons in the nucleus. These, of course, are always balanced by the proper number of electrons outside. Hydrogen, the lightest element, has only one proton and no neutron in the nucleus, with a single electron spinning around it. Uranium, the heaviest basic element, has a nucleus consisting of ninety-two protons and 146 neutrons, balanced by ninety-two electrons.

The way to smash the atom is to unbalance the nucleus, either by breaking it apart or by making it over-weight. This is done by bombarding it with projectiles of the right size and speed. Protons, usually obtained by stripping the electrons from atoms of ordinary hydrogen gas, are one convenient type of bullet. Deuterons, nuclei of heavy hydrogen, are another. Any atom smashing machine is simply a device that creates these projectiles and gives them speed enough to smash into the cores of the atoms under bombardment. Such speeds are obtained by placing the missiles in an electrical field where the difference in potential gives them a high rate of motion. Tremendous speeds are necessary, and tremendous voltages are required for creating the high speeds.

Such speeds are necessary to overcome the effect of the mysterious "glue" that holds a stable atom together. If it were not for this atomic gravity, billions of times more powerful than the terrestrial gravity that we know, every element would break down into hydrogen. The world and the universe would become nothing more than a fog of hydrogen gas.

(Continued to page 116A)



Top, assembling new oscillator for cyclotron. Bottom, white mica used for experiments with radioactive elements

at Berkeley, Calif



# Electric Piano Tutor Helps Novice Play Tune

*Piano Master Keymaster*



Left, player roll lights chord on transparent keyboard attachable to any piano; below, it controls lights beneath plastic keys of piano itself. Ruby signal for pedal is seen on keyboard, left, and on player case below



With the guidance of an "electric teacher" just invented, even the beginner can play tunes and chords on a piano. This robot instructor consists of a keyboard beneath which are guide lights controlled by a paper roll similar to that of the conventional player piano. Its purpose is to quicken and hold the interest of the novice pianist by letting him play tunes, albeit slowly, at the outset instead of mere exercises; and to aid the teacher himself in illustrating fundamentals. Two types are being introduced; one comprising a dummy transparent keyboard that can be installed on any piano; the other is a constituent part of the piano itself, which has a keyboard of translucent plastic, with a tiny electric bulb under each of the fifty-six central keys. Virtually indestructible and flame-resistant, these plastic keys are ivory and blue; any color combination however, can be furnished to harmonize with modern decorative schemes. As the player roll winds slowly past a brass bar, tiny electric wires drop through slots in the paper to make contact and light the corresponding key. A tiny red light calls for the pedal. Speed is governed by a rheostat; the roll can be stopped at any point to study a chord or fingering, the proper fingering being indicated by num-

bers at the left of the paper roll, while words, if the selection is vocal, are printed at the right of the roll. The player mechanism plugs in on ordinary house current, and is easily removed when not in use. It is possible to transpose to higher or lower key simply by changing the position of a multiple contact switch which plugs in at the back of the piano.

## Automatic Humidifier Control Stops Window Condensation

*Windustal*



Comfortable humidity in the house without condensation on the windows and outer walls is made possible by a control which can be installed in

18.00 for Baltimore and Central Ave.

*Piano and Keymaster Combined - Story and Clark, 64 E. Jackson Blvd. Chicago. Portable Keymaster - Carl Rupp, Piano Master 614 N. Carpenter St. Chicago. Windustal Corp. 30 West 42nd St. New York. P. H. R. Co. 1717 N. 1st St. Baltimore. P. H. R. Co. 1717 N. 1st St. Baltimore. P. H. R. Co. 1717 N. 1st St. Baltimore.*



the window. In cold weather it is difficult to maintain indoor relative humidities of forty to fifty per cent without water running down the windows to the sills and even the walls and floor. The new window control, however, incorporates an element sensitive to high humidity; it detects a condition approaching condensation and automatically shuts off the humidifier unit until further moisture can be added without condensation occurring.

### Half-Size Propellers Cut Plane Weight

Twin propellers, mounted tandem eight inches apart and whirling in opposite directions on concentric shafts, may solve the problem put to aeronautical engineers by the constantly increasing size and power of aircraft motors. Today the largest army airplanes call for thirteen-foot propellers, and even larger and heavier blades would be necessary if motors progress further. By using the tandem propellers, however, their size could be cut in half, and this method is being tried by army engineers at Wright Field, Dayton. An Italian plane, the only tandem-propelled ship now flying, set the world's airplane speed record of 440.681 miles an hour in 1934. A difficult problem is the designing of concentric propeller shafts, one rotating inside the other.

## Big Flag Painted on Ship Deck Is Warning to Raiding Pilots



Unusual photograph of British battleship, showing giant Union Jack painted on deck to warn airmen

To prevent Japanese and Chinese air raiders from making a mistake, a huge Union Jack has been painted on the deck of the British battleship "Cumberland." The ship has been operating in Chinese waters where craft of other nations have been attacked, by mistake, during the undeclared war.

## "Cold Light" on Figure in Bulb Gives Varicolored Glow



Bulbs with small figures that glow in "cold light"

Operating on a new principle of electronic ionization of rare air vapors, a bulb now on the market employs "cold light" for novel effect. Inside the bulb is a molded figure of an animal, a person or a flower. When the bulb is switched on, the figure glows softly in various colors. Used primarily for decorative purposes or as a source of subdued illumination, the bulb is guaranteed for 2,000 hours.

Aerolux Corp. 653 11th Ave New York



2906 E. 18th  
Kansas City, Mo.

## What Happens in Rear Axle Is Revealed by Gauges



Apparatus in place to test rear axle's operation under driving condition loads

Twelve gauges measuring every possible deflection assumed by the parts in an automobile's rear axle under a given load constitute one laboratory test in the Chevrolet plant. A weight is hung on the end of the drive shaft, corresponding to a maximum load on the axle under actual driving conditions. All movements or deflections of the drive shaft, pinion and ring gears and axle shafts are then read on the gauges. This checkup results in better mounting of bearings to prolong axle life.

## Vise Aids in Mounting Negatives in Lantern Slides



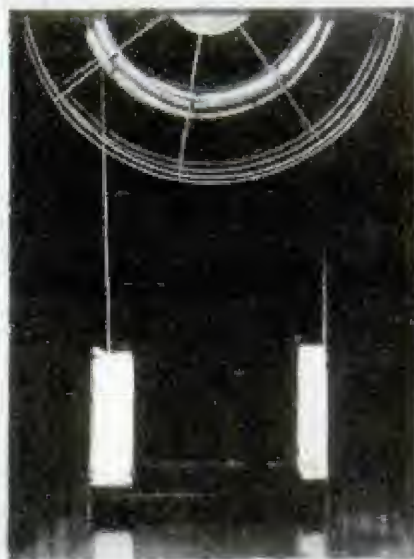
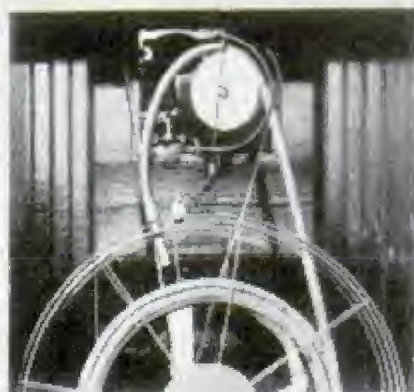
Designed for mounting lantern slides from photographic negatives, a new vise holds the slide tightly until released. By pressing a lever, the slides may be inserted or removed quickly. Short rubber feet

keep the vise in position on smooth or rough table surfaces. All sizes of slides can be handled by the tool.

## Hose Housing in Basement Wall Has Opening to Outside

Equipped with a port opening to the outside, a garden hose housing may be built into the basement wall, thus making the hose available for inside or outside service. Pulleys make the hose easy to handle. A large pulley acts as an automatic stop, preventing the hose from reeling back. When the water is turned off, the automatic stop hook, accessible from inside or outside, is disengaged, permitting the hose to go back into its housing. The inside opening in the basement is two and one-half feet by six and one-half feet, while the outside port is twelve inches square. The housing is complete with frame, shut-off cock, plumbing pipes, reel and pulleys.

*Inmaster*



This is basement side of hose housing



# 160-Foot Steeple Hoisted to Church Tower

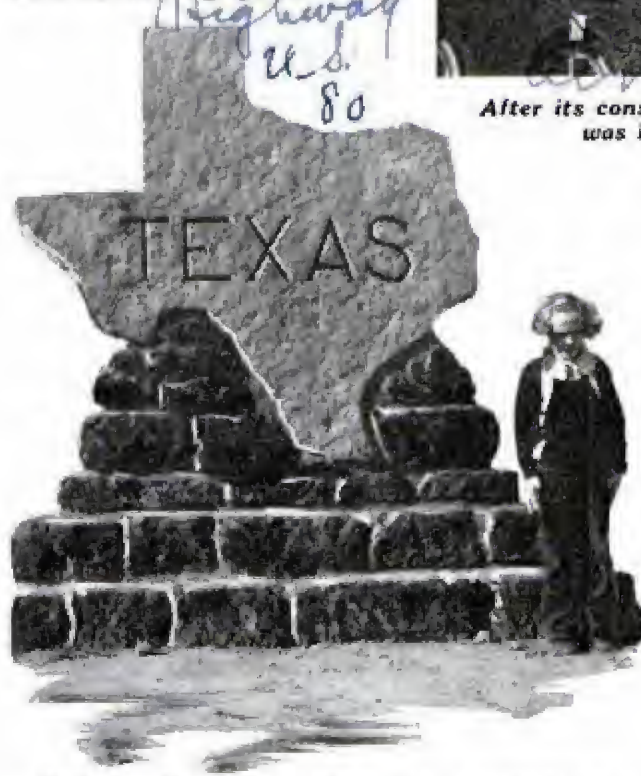
After being constructed on the ground, a 160-foot steeple for a Denver, Colo., church was raised into place by derrick. This procedure reduced the hazard of building the steeple high above the ground. Use of the derrick simplified the job of hoisting the spire to the top of the church.



After its construction on the ground, the steeple of a new church was hoisted to its place atop the building's tower

## Granite Outline of State Marks Boundaries

Outlining the state's borders and with the state's name across it in large letters, a big granite block marks boundaries on all principal highways entering Texas. The granite block, shaped like the state, is set in solid masonry, heavy enough to resist vandalism. The markers replace wood-and-metal signposts.



State's outline in granite is shown mounted on permanent foundation

## Home Transformer Adds Power to Operate Appliances

For homes receiving insufficient electrical power to operate refrigerators and other appliances, a power booster transformer is available. By plugging in the transformer to any convenient outlet, the unit permits selection of three different voltage taps. The taps, of 100, 115 or 125 volts, are selected by a convenient switch on top of the transformer.



Jefferson Electric Co.  
2022 N. 1st St.  
St. Louis, Mo.



Explorimeter - Mine Safety Appliances Co.  
 430 N. Broadway  
 Philadelphia, Pa.

# Life Saving INVENTIONS

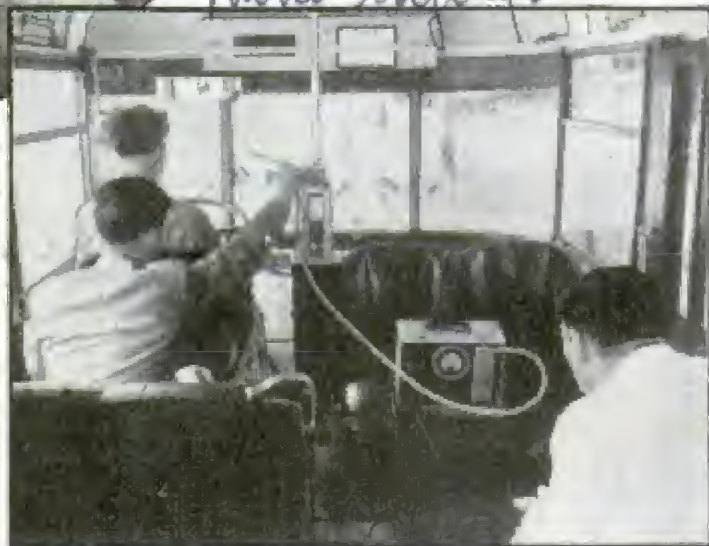


Top, worker with eyes protected by goggles. Bottom, left, using pocket-size gas indicator. Right, testing motor coach interior for carbon monoxide

Accidents considered an inevitable part of the construction business, steel mills, railroads or any other field. Business has found it profitable to tackle the causes of accidents and to anticipate them. Apart from its humanitarian aspects, safety is regarded as good business.

In 1920 the rail-

road Safety.



WHEN America was growing up, it was regarded as certain that one workman would be killed for each million dollars worth of dam or bridge construction. Steel workers had their own adage: every time a trainload of steel left the mills, one employe went to the undertaker. Skyscrapers were figured at one life to a floor, and railroads frequently were estimated to have cost one fatality for every tie in a transcontinental route.

Times have changed. No longer are ac-

roads' bill for accidents hit \$215,000,000. Officials launched an intensive campaign to reduce accidents and by 1936, the dividends earned by this safety program in a single year amounted to \$162,253,971. Only \$53,000,000 was paid out in personal injury and damage claims in 1936, compared with \$215,000,000 in 1920. Safety devices, equipment and education have cost United States Steel company \$24,860,500 but in return the company has saved approximately \$117,000,000 in accident expenses.

Goggles, Wilson Products Co.



# PAY DIVIDENDS

As you know, the mine safety apparatus  
Braddock, Thomas and Meade  
Pittsburgh Pa



Top, rescue crew testing for carbon monoxide with special detector. Bottom, taking trash from mechanism of moving farm equipment is dangerous



A tractor company saved an eye every eight days on the average—an actual dollar-and-cent saving of \$90,000—by putting goggles on all workers engaged in grinding tasks. A large manufacturing company experienced the loss of sixty-three eyes within a short period before it became accident-conscious. For more than three years after their application of approved methods, only two eyes were lost. When a worker refuses or is careless about wearing his goggles, he generally changes his

mind when a foreman hands him a small package with a casual, "Here, buddy—you'll be needing this before long."

Upon opening the package he finds a glass eye and a small card which asks, "Would you swap one of yours for this?"

Likewise, work shoes with safety toes and other special features have achieved popularity for the same reason.

"Before we paid attention to work shoes," asserts the safety director of a motorcar company, "our cost per foot injury amounted to about \$125. We decided to give the special shoes a trial and by equipping ninety per cent of our men in this manner, we have reduced our cost per foot injury to approximately two dollars and fifteen cents."

The economy of this simple measure was brought home to the employees of a steel mill recently. One employe happened to





There are many ramifications to the safety engineer's work. While one is showing a farmer the correct method of chopping wood another may be designing a guard or an automatic stopper for a machine to prevent its operator from feeding his fingers into its hungry knives or gears when he starts day-dreaming.

"Last month in Chicago," explained W. H. Cameron, one of the country's leading safety men, "a child was killed in the wringer of an electric washing machine. It was a death that should not have occurred because there was an invention last year which automatically stops the electric wringer when it clogs. We followed up on the case and as a result, the association of washing-machine manufacturers has announced that within a few months every machine will have an automatic stop device on it."

place a mill roll weighing 1,000 pounds on a board at the end of a lathe bed. The board had cleats on the under side and when the chain block was removed the board tipped upward causing the roll to fall on the worker's foot. Because his shoes had a steel box toe, his foot was uninjured.

That same day, a worker in the same mill dropped a brick on his foot and broke one of his toes. When asked why he wasn't wearing safety shoes, his reply was he couldn't afford them. Because of the injury he was off four weeks. Inasmuch as the compensation paid to an injured worker is seventy per cent of his weekly earnings, the man lost thirty per cent of his wages for four weeks, which, in this instance, amounted to \$26.88.

Thousands of persons have found a profitable career in this science of keeping people from killing themselves. Because of their work, 270,000 persons are working at their jobs instead of having been killed, that figure being based on the rate men and women were losing their lives in industry before the safety movement began.



Top, latest type of sandblast helmet protects the worker's head without obstructing vision. Bottom, farm workers should stop the tractor before leaving the seat

Within the last few years, serious study has been given to the dust menace by these engineers. In the wood products industry, for example, dust was at one time looked upon simply as a nuisance that could be removed by broom and shovel methods when it began to cover up the tools. But the engineers found wood dust was a serious fire and explosion hazard and a threat to the workers' health. Many respiratory diseases were traced to the minute particles of wood, synthetic materials, and abra-

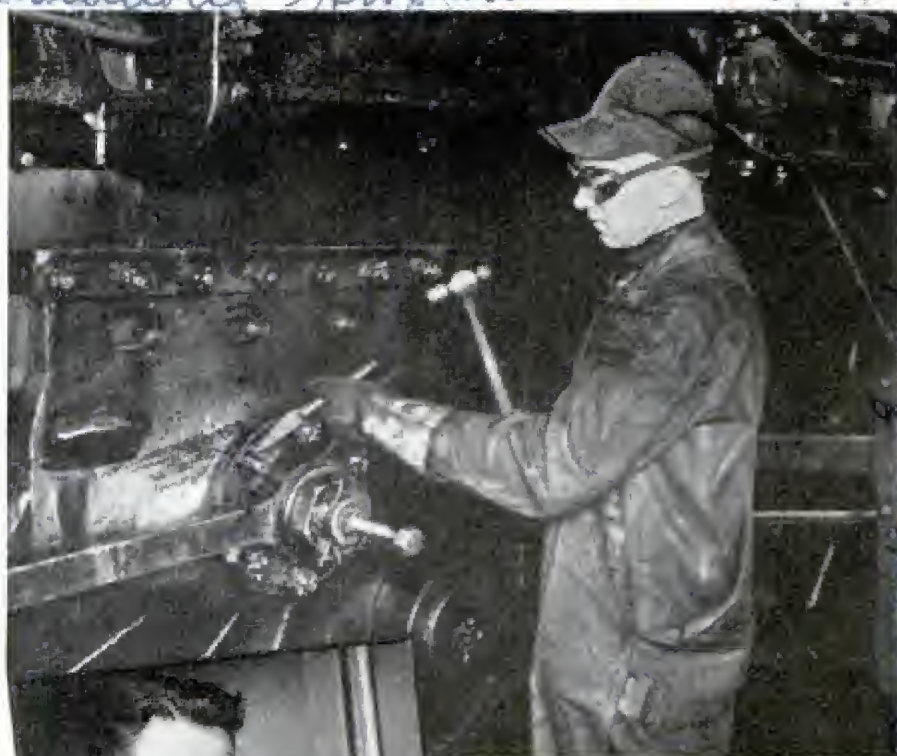
William Products Inc.  
Reading Pa.



sives breathed into the lungs. The toxic properties of certain wood—generally of tropical origin—also have been recognized as a health hazard.

The prescription was ventilation, moving air to carry away the dust to a place of safety. This gave rise to another fire hazard however, as the ducts used to carry out the dust also carried the fire. Constant study has resulted in better equipment and more efficient methods.

Work on this problem has been intensified greatly since 1933 when public attention was directed to an industrial disease known as silicosis. Full realization of this disease's significance was manifested by a flood of claims in states providing workmen's compensation for silicosis and similar dust diseases and a large number of com-



mon-law actions in states not compensating for the disease. As a result, a major study of the disease was made and dust-control equipment and special respirators are being used to fight it.

The latest dust-control equipment not only guards the workers' health and saves machinery from the ravages of dust abrasion but also gives particular attention to removing from the atmosphere very fine dusts which have a commercial value. Some of the well-known products are: dry powdered chemicals, cement, ground-rock products, and dry powdered foods. The reclamation of these materials frequently pays the cost of the equipment in a short time.

Laboratory-made noses also have played a great part in cutting down the number of deaths and accidents in certain indus-

Top, eyes are saved in this manner. Center, sensitized paper being placed in mercury vapor detector. Bottom, testing tank car for combustible vapors

(Continued to page 152A)

R 30 H. B. Smith Mine Safety Appliances Co.

Journaling Equipment Co. Machinery Washed and

American



# Folding Bathroom Scales Hangs on Wall or Door



Top, scales in normal use. Bottom, folded and hanging on the bathroom door

Folded and hanging on door or wall, a small bathroom or dressing-room scales is ready for instant use. A slight outward pull frees it from the wall and unfolds it to rest on the floor, there to be used in the usual manner. Folding and restoring the scales to the wall occupies only a few seconds. Two screws hold the scales firmly on the wall or door.

## Oil Burner Cut Off Instantly by Safety Control



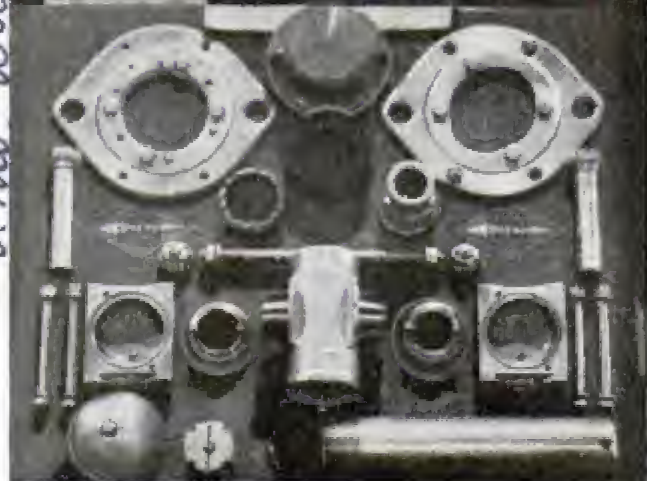
Among the latest safety devices for control of home heating plants is a device which shuts off the oil burner instantly in case of ignition failure.

This prevents the burner from continuing to pump oil into the combustion chamber after the flame has gone out. Most controls permit operation of one and one-half to three minutes after the flame stops. The

latest control is wired in with the transformer of the burner so that if the transformer fails, and hence the ignition fails, the current to the motor is shut off at once.

## "One-Armed" Aircraft Propeller Varies Pitch Automatically

By adjusting its pitch constantly to the most efficient angle, a single-bladed propeller always delivers the maximum power at all speeds and under changing atmospheric conditions. Tests indicate that this "one-armed" propeller develops twenty-five per cent greater thrust in an air stream than the conventional two-blade "prop," and reduces vibration. Stub and blade are balanced. The mechanism in the hub permits the blade to swing forward and back; with the airplane standing still and the motor at top speed the blade inclines forward and pivots to the "low pitch" ideal for takeoff and climb. As the ship moves forward, centrifugal force in-



Top, variable pitch propeller with weighted stub balancing single blade; below, parts for mounting it



clines the blade backward to right angles with the crankshaft, and at the same time the blade pivots to a higher pitch. The balance between centrifugal force and the air load always keeps the blade at the best pitch for the speed of the plane.

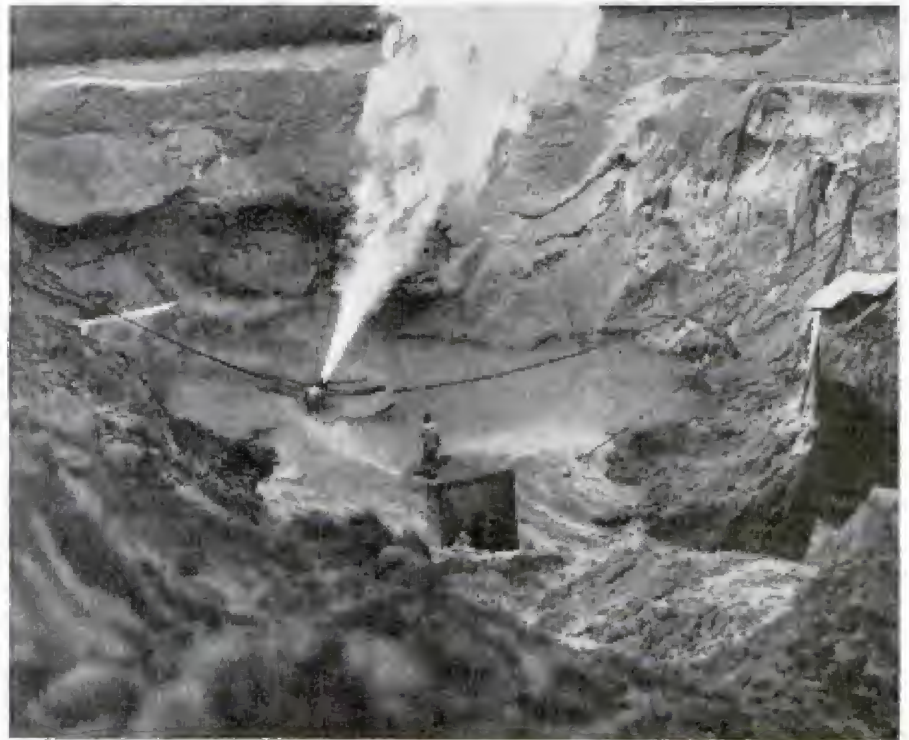
### #145 'Cape Cod' Cottage Is Fire Station with Vanishing Doors

To the passerby, a Cape Cod cottage at Truro, Mass., appears to be a simple little home with shingled walls, shuttered windows and a white Colonial door with ship's lanterns. Appearances are deceptive. It's really the fire and ambulance station. When the alarm rings, two sections of the front wall, including the two windows and blinds, slide up and disappear under the eaves, leaving wide exits for the fire truck and ambulance.



Above, it seems to be a Cape Cod cottage. Below, the doors swing up and it proves to be a fire station

## #179 Flaming Oil Well Is Tamed by Asbestos-Clad Firemen



Earth slide on far side of crater helped smother flames of this oil well. Observe the pressure in the jet of burning gas escaping from casing

*La Blanca Oil fields*  
It took three weeks of steady—and hot—work by asbestos-clad fire fighters to tame a blazing oil well in southern Hidalgo county, Tex. A slide of tons of dirt into the "crater" smothered the flames. The firemen had to straighten the surface casing and lay a concrete apron around it to hold it in place. The terrific pressure of burning gas escaping through the casing is indicated in the picture. The crater was flooded with water so that gas escaping at any point could be detected by the bubbles.

### H 220 Lighted Gauge for Mixing Paint Signals to Stop Pouring

When the matching of color samples requires exact measurement of paints, an illuminated gauge just put on the market is helpful. It measures the paint as it is added in the can. This gauge has a light inside it which appears to go out when the exact amount has been poured.



*Cont. Jack Johnson*

*Sherman, Williams*  
*Ca 101 Park Ave*



## Ironer Controlled by Elbow Leaves Both Hands Free

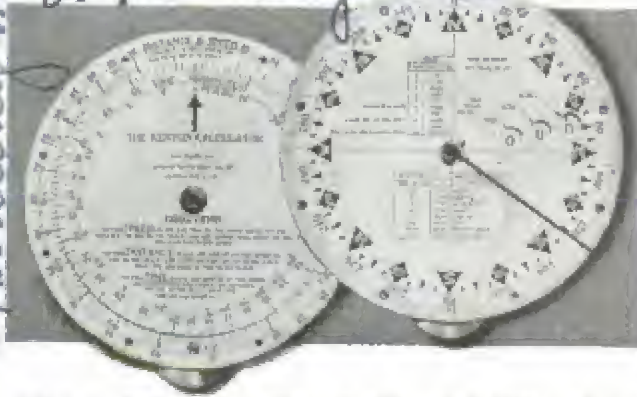


Table-top ironer, easily portable yet big enough to handle sheets, is operated by elbow touch on lever

Operated by the touch of an elbow on a lever, a portable ironer just introduced leaves both hands free to guide the work. It is a table-top model weighing only twenty-three pounds, large enough to handle anything from handkerchiefs to sheets. When not in use this electric ironer stands on end, occupying only ten square inches on a closet shelf.

## Three-in-One Navigation Tool Fits into the Pocket

Small enough to fit into the pocket, a three-in-one navigation instrument is on the market. It consists of a calculator, a



This instrument, serving as three navigation aids, is handy for the yachtsman

course measure and a course protractor. The calculator helps to determine the speed of a boat, the distance run or the time of the run, if the other two quantities are known. The course measure, used with standard charts, shows the length of straight or bent courses in nautical miles. The protractor is used for determination of course directions in either degrees or compass points. The navigation tool is made of heavy white celluloid and brass.

## Synchronizer for Twin Motors Lessens Boat Vibration

Decreased vibration is said to result from the use of a device which helps to establish and maintain rotational synchro-



Arrow points to synchronizer which controls twin motors. Inset, the synchronizer

nism between two battery ignition motors. The device is handy on a cruiser or yacht equipped with twin motors. First, one engine is brought to the desired cruising speed by means of the throttle. Then the speed of the second engine is matched with that of the first. An indicator on the device's dial shows when the motors are synchronized. Then a switch is operated, locking the motors together, after which neither rough seas nor putting the helm over hard will disturb the balance. The synchronizer also may be used as an indicator of ignition trouble.

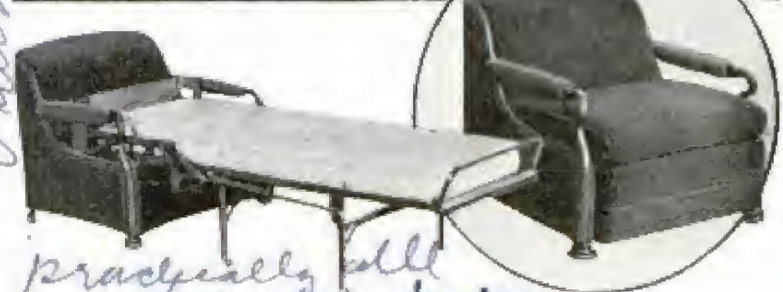
Kenyon & Armstrong Co. Inc. 143  
Huntington St. N.Y.C.  
273 New York Ave.

Synchronizer - 131 State St. Boston, Mass.



# Living-Room Chair Is Convertible into a Bed

If the unexpected overnight guest drops in, the small home or apartment dweller need not be embarrassed by lack of beds. A chair recently placed on the market is convertible into a comfortable bed on short notice. Looking like a smartly styled living-room chair, it has concealed within its structure a bed which unfolds upon being pulled from its hiding place. A soft inner-spring mattress attached to the bed offers comfort to the guest. The mattress may be removed easily for cleaning or airing. The bed is full length and supported at proper height from the floor. Bedclothes of the standard size may be tucked in all around. A guard rail prevents pillows from falling off the bed. In use at night, none of the chair's upholstered parts, cushion, back and arms, is used as a part of the bed. Due to careful balancing, the bed is easy to open or close.



Top, unfolding the bed-chair. Bottom, ready for sleeping and (circle) for normal use as a comfortable chair

## Expansion Joint for Concrete Takes Bumps Out of Road



Showing automobile about to pass over expansion joint that makes riding easy

Suitable for sidewalks, retainer walls, loading platforms, airport hangars and runways and other large concrete areas, a non-extruding joint filler is available for the builder. It eliminates the unpleasant bumps so often experienced when a car is driven on highways over ordinary asphalt joints which have extruded under the pressure of expanding concrete. The joint filler is made of cane fiber impregnated with a durable asphalt by a patented process which coats all the fibers for necessary moisture protection, but leaves their cellular character practically unchanged. The fact that the filler re-expands when compression is relieved, coupled with its bond to concrete, eliminates cracks and the necessity for refilling the joints each season.

Carbon monoxide can be detected in caissons and similar enclosures by its action on a tomato plant, which is wilted in a minute or two by this gas.

Celotex Corp., 919 N. Wacker Drive

National Safety Council  
20 N. Wacker Drive



2. load

## 2340

By James C. Wilson  
Hall's River, Colo.

"You take the water, Jim" said Flood. "I'll get along." Bloodshot eyes, parched lips—he looked like a haggard



# on ONE LUNG

*Top, when the motorcyclists reached the fort at Mao they looked like this. Bottom, creaking water wheels along the Nile*



ghost. For two hours I stalked that jackal. The sun went down. The jackal was now only a faint gray blur. Up over a low saddle I followed to the rim of the next cuvette. And there in the bottom was a stinking little pool! I scraped off the scum of algae and dead insects and lowered my canteen. Exultantly I staggered back to camp. We strained it, settled it with alum, and made tea. It was the rottenest tea we

ever tasted, but it saved our lives. Back on the trail again, we dropped down through a series of bluffs and dunes into a scorching little valley, found the ground covered with huge thorns, and before we could stop, had punctured all six tires. Luckily there was a village near by. While friendly tribesmen pulled out the thorns, we got a tanned antelope hide from the village leather worker, cut it into strips





and installed it as puncture-proof linings in all six casings. No more flats.

The story of mankind in north central Africa is the story of a never-ending search for water—water for the thirsty herds, the parched and shriveled crops, for man himself. We camped with herdsmen who watered their cattle and drove them out to pasture on the first day, pastured them the second, and drove them back to water on the third. For two months, their cattle didn't drink at all! They ate the wild watermelons that grow like big green basketballs out of the sand.

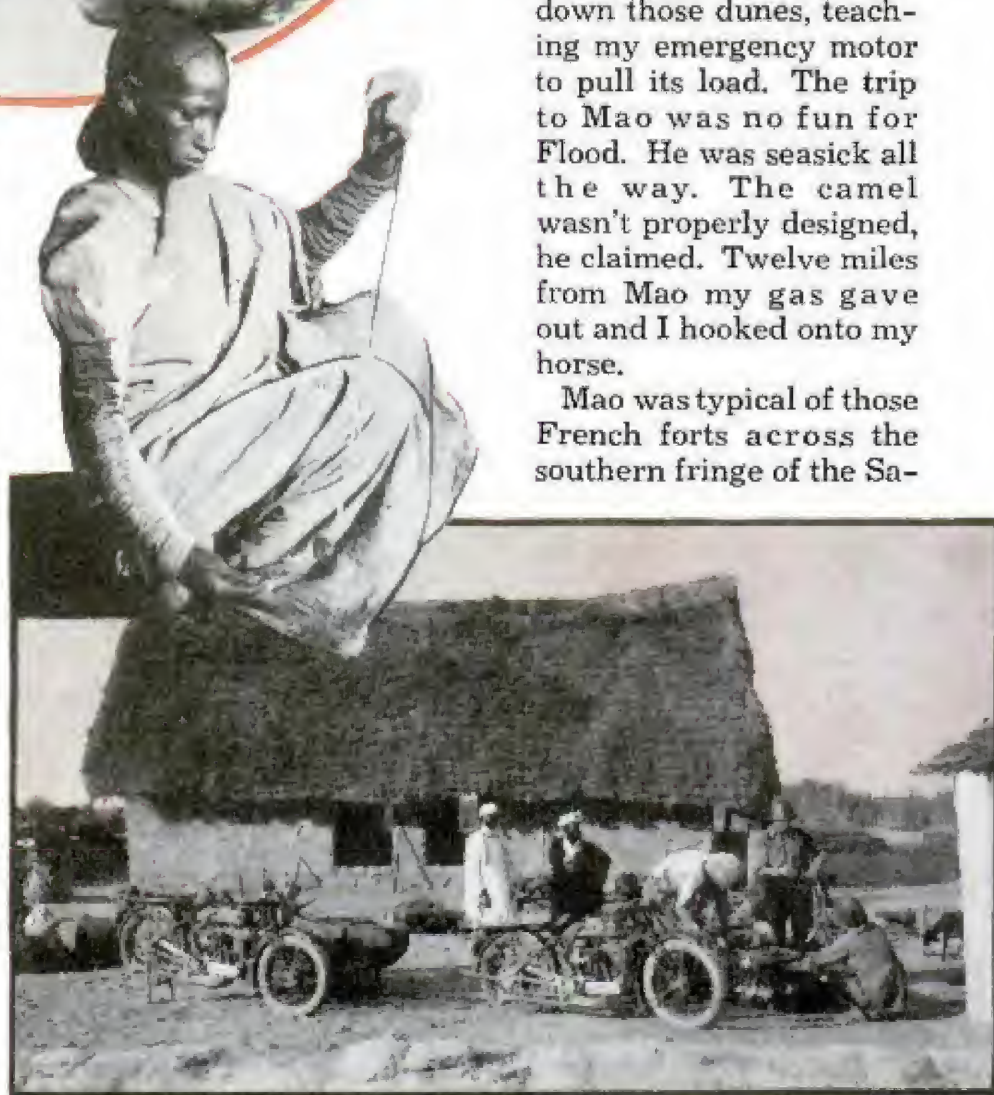
When we reached the fort of Rig-Rig, ninety miles from Mao, we were two tattered, bleary scarecrows, but the little Corsican commandant welcomed us. The first white men he had seen

for seven months. Flood's piston pin, which had burned out from lack of oil, was pounding like a riveting hammer, and we were almost out of gas. How to get to Mao?

"I have eet!" exclaimed the commandant. "We will load M'sieur Flood on one camel and his motorcycle on another, and you shall drive your machine until ze petrol is finish' and zen you shall have a motor zat eat grass—a horse."

First we had to make a harness out of antelope hide. Then we had to break the horse. For two days we plodded up and down those dunes, teaching my emergency motor to pull its load. The trip to Mao was no fun for Flood. He was seasick all the way. The camel wasn't properly designed, he claimed. Twelve miles from Mao my gas gave out and I hooked onto my horse.

Mao was typical of those French forts across the southern fringe of the Sa-



*Top, Arabs at one of the three wells between Khartoum and Kassala. Center, Hausa girl spinning cotton. Bottom, time out for repairs at rest house in French Equatorial Africa*





hara. A square-cut crown of grim clay battlements, often several acres in extent, rising out of a mountain of gray sand. Always a village in the cuvette at the bottom, and the village millet and cotton patches, wells, spreading palms and paw paw trees, and the fort garden. Here in these far-off outposts of the white man's authority in the Sudan lives one Frenchman, or perhaps two or three, commanding a battalion of native soldiery and serving as administrator over a territory of several thousand square miles. Except for articles of native manufacture, everything in the fort at Mao, including the primitive spark radio transmitter and gasoline to power the engine, had been brought up twelve days by river steamer, five days by motor truck, and forty-five days by camel to get it there. The French government had agreed to let us have what gas we needed, at cost. We picked up forty gallons and wrote our check for \$140.

Now, what about a wristpin bearing to fix Flood's engine? The radio operator had several extra bushings, but none the right size. But he had junk boxes. In the last one, I discovered a heavy bronze pipe, half buried in greasy dirt. The inside diameter was too small, but the radio operator had a rattail file, so I soon fixed that. We heated the top of the connecting rod, forced out

(Continued to page 130A)



Top, improvised blacksmith shop for repairing the bikes. Center, a "Fuzzy-Wuzzy" from Red Sea hills. Bottom, guests of a Sudanese sheik



## Plastic Letters for Titling

### Have Lasting Adhesive Back

*also at photo supply houses*



*These plastic block letters can be used indefinitely for movie titling, for their adhesive backing does not wear out*

Interchangeable plastic letters that will stick to any smooth surface are the latest thing for titling movie films. They are deep-cut block letters backed by an adhesive that never wears out, so that they can be removed or changed about readily yet hold their position while being photographed. They are used also for merchants' counter and window display signs. Striking effects can be produced by side-lighting the thick letters or mounting them on glass with back-lighting.

## "Barrel Roll" of Surface Water Caused by Cooling Wind

Have you ever noticed, on an ocean voyage, long parallel streaks of floating seaweed pointing in the direction of the wind with spaces of clear water between them? Dr. Irving Langmuir, Nobel prize winner, observed this phenomenon and theorized that the seaweed was carried to its position by cross-wind currents on the surface. Later he experimented, and found that wind causes the formation of invisible, slow-turning rollers that extend

downward for several feet, their long axes parallel to the direction of the wind. They turn in opposite directions, one roller to the right, its neighbor to the left, with a corkscrew or "helical" motion. This, Dr. Langmuir believes, results from the wind cooling the surface water and causing it to sink as water rises to the surface. In observing this rolling motion Dr. Langmuir set afloat dyes, oil, white strings supported with corks and umbrellas with lamp bulbs as floats, and watched their movement in the water.

*H-25.*

## Paper Chick-Feeding Tray Is Inexpensive and Clean

Costing much less than a metal feeder, a cardboard feeding tray for chicks promotes healthy broods because it is sanitary and can be replaced as frequently as desired. Folded flat for shipping, it is printed on an ordinary printing press and lends itself to advertising by hatcheries and feed dealers. Each brood can be started on new, uncontaminated trays which last until larger equipment is needed. When set up, the trays are held together by paper clips.



*Shipped flat, the cardboard pattern folds easily into feeding tray, held in shape by paper clips*

*General Electric Supply Co. Inc. Box 6*

*Besbee Product Corp. 710*

*General Electric Supply Co. Inc. Box 6*

*212*



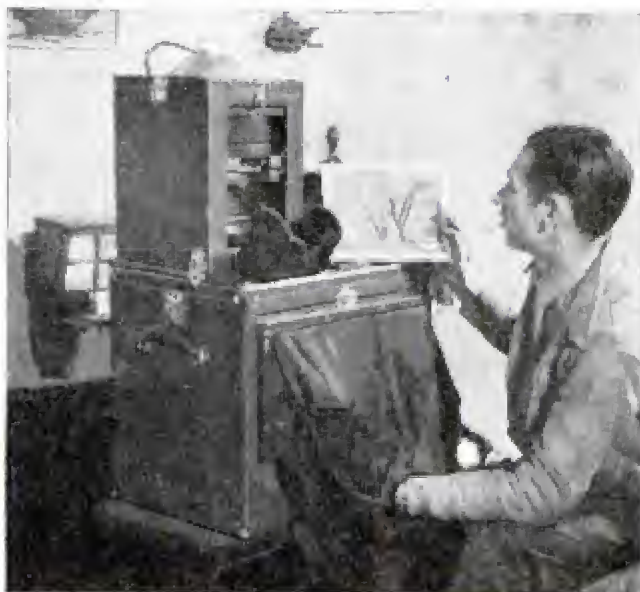
## Fitting Coils in Big Condenser Is Expert's Job

Calling for the hand of skilled operators is the task of fitting insulated copper coils in the grooves of an armature of a giant condenser. This job is called "putting in the throw." Just recently a photographer caught the experts at work on a 13,200-volt, 7,500 kilo-volt-ampere synchronous condenser being built by the Westinghouse Electric and Manufacturing company. A condenser of this type can be used to control the power factor or regulate the voltage on a power line.



*Right, expert workmen fitting insulated copper coils into the grooves of a giant condenser's armature. The craftsmen call this job "putting in the throw"*

## A 'Suitcase' Photo Darkroom Includes Enlarging Camera



*Photographer examining an enlargement he has made in portable darkroom set up in his hotel room*

In a compact carrying case not much larger than a suitcase, a news cameraman has built a darkroom for developing and even enlarging his pictures on the road. The entire outfit weighs about twenty-five pounds, and holds tanks for developing cut film up to the five-by-seven size. The enlarging camera accommodates negatives as large as five by seven, and makes enlargements up to eight by ten. Handy for any photographer on vacation or business trip, it enables a news cameraman to develop and print his pictures in the field or in an automobile, in hotel room or trailer, for the power line can be cut into an automobile circuit or other supply. The parts are telescopic and fit into a case twenty by eighteen by fifteen inches.

*Mr. Ernest C. Selin, Oklahoma  
3143 N. 11th St. P.O. Box*



251150 Mr. James H. Schreyer  
431 W. 60th Terrace  
Kansas City, Mo.



## LATEST TRICKS *of the*

By William E. Garity

Production Manager, Walt Disney Studios



Top, artist working on background used in animated film.  
Bottom, special camera for filming multiplane backgrounds  
to give three-dimensional effect

A NEW technique in film animation has been developed in the production of Hollywood's first full-length color cartoon.

For nearly three years, writers, artists, musicians, sound-effects men and technicians have been at work on a million-dollar investment in movie making that combines the quaint delightfulness of imaginary characters with real story and production values.

This picture embodies many new animation principles, in fact, the technique employed in the making of this fantasy may modify our branch of the industry as greatly as did the invention of sound and color.

Our new background treatment makes possible the dream of every motion-picture producer: the illusion of a three-dimensional effect. Backgrounds, as you prob-





## ANIMATED FILM *Makers*

ably know, are made separately from the figures which supply the action. They correspond to the sets erected on the sound stages of the regular studios. Under the new plan, these backgrounds are constructed on a multiplane principle and photographed with the characters, which are still being drawn on flat surfaces. With soft focus lens and special controlled lighting effects on each of the background levels, which are physically set apart from one another, we have given scenes a depth that is three dimensional in effect. A camera, costing more than \$75,000 to build, is required for this work.

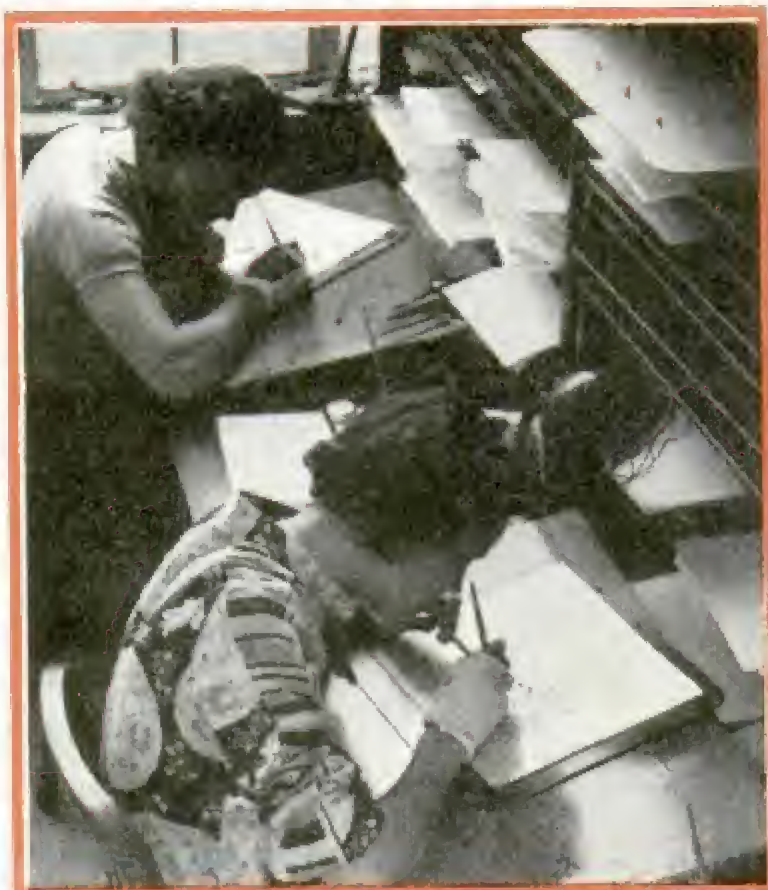
In filming a scene of a cabin in the valley, for example, we have a cardboard strip that represents the immediate foreground; a short distance under it is another strip for the foreground in which the cabin is shown and, perhaps, the place where the action takes place; back of this another card for the middle distances showing the trees and foothills, and lastly, the background proper on which appear the far-away mountains and the sky.

The multiplane background has given us



Top, drawing of Donald Duck and some of the animal characters that appear in "Snow White and the Seven Dwarfs." Bottom, film animator





a number of production aids. We can obtain special effects by using lights and filters behind each of these levels. Supposing a couple are shown in the moonlight. They can be brought into a close-up with the moon remaining in the same position as before. A mathematical system has been devised by which the background maker can determine the speed with which the background elements should move so as to preserve the artist's original conception of the scene. If a man is shown riding along in a motor car with certain objects moving toward him, the people and buildings that are but a few hundred yards away must appear to come along much faster than the mountains many miles in the distance. Then, too, in a panorama shot, the correct perspective principles must be observed so that the elements move in proportion to the relative distance away from the person who is viewing them and with due consideration of the speed at which he is traveling.

When this production was first begun, it was evident it would have to be "sold" to the audience on an emotional basis. In the early minutes of the film, we felt, the theatergoer would have to be convinced he was not looking at so many colored drawings but real personalities, animations which lived and breathed. An elongated Silly Symphony was the wrong approach. It would not be able to hold the audience's interest for ninety minutes. Likewise, a straight pen-and-ink translation of a live film was ruled out on similar grounds. To be a success, the production needed drama, pathos, humor and the other essentials, so we combined live-action picture methods with the cartoon technique.

We have tried in this picture to caricature rather than simulate human traits and actions. Because the story is based on the immortal Grimm's fairy tale, "Snow White and the Seven Dwarfs," the characters live in the realm of fantasy but are imbued with many human traits. In the Seven Dwarfs, which answer to the expressive names of Doc, Grumpy, Bashful, Dopey, Sneezy, Sleepy and Happy, you probably will recognize qualities, foibles, and mannerisms you have observed in yourself, your boss, the



Top, artists tracing original drawings on sheets of celluloid. Bottom, recording musical background for animated film at the Disney studios. Receivers are worn to hear the tone beat



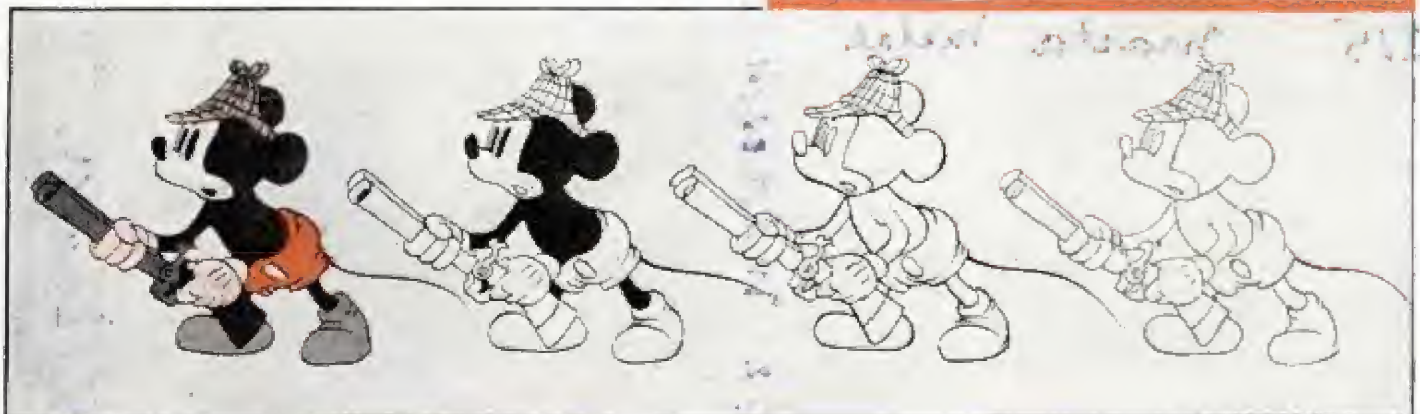


fellow next door or someone you know.

The question of color treatment presented a fresh set of difficulties. The bright hues of the short subjects were taboo. The audience might suffer eyestrain looking at such colors for an hour and a half. We had to select soft hues that were restful on the eyes and that harmonized with each other. Color, when expertly used, can help set the mood of a picture and aid in the advancement of a plot without the audience ever being conscious of it.

Great precision was shown in the making of this picture and as a result it is virtually free of the inaccuracies that pass unnoticed in the seven-minute cartoon film. The infinite pains taken by men who supply the action cartoons may be gathered from the fact that their working tools

(Continued to page 114A)



Top, colorist examining painted "cell" of Mickey Mouse drawing. Center, "cells" under camera. Bottom, step-by-step drawing of Mickey Mouse in color



Brilliantly colored rabbits, bigger than a man, are used to attract shoppers around the Easter season in a suburban section of Kansas City. The eyes are electric-light bulbs, and reflector lamps shed a festive glow on the painted figures at night. Various figures are used at other seasons.

## Imperishable Metal Movie Film Reflects Pictures to Screen

Movie films of metal, reflecting their pictures to the screen by mirrors instead of transmitting them through transparent cellulose film, may solve the problem of preserving records through coming centuries. The photographic industry is still too young to know how long cellulose nitrate and acetate films will last. But an inventor has developed an imperishable metal film on whose opaque surface the

photographic image can be printed. Pictures printed on non-ferrous metal sheets twenty years ago show no signs of fading. Similar metal film suitable for projection has now been prepared; it is flexible, and withstands the heat of projection machines and the attack of photo-developing chemicals. Highly reflective mirrors carry the image to the silver screen. One test film used continuously for four weeks showed no signs of wear. Such films could be used to preserve master copies from which cellulose duplicates could be made.

N/54.

## Twin Trucks Strapped to Load Make Handling Easy

Handling stoves and similar heavy objects is made easy by small twin trucks that may be strapped to the load. Each unit is constructed along the lines of the standard single hand truck, but has smaller wheels to facilitate loading. A truck is placed at each end of a stove and the stove is lifted to rest on a narrow felt-lined ledge on each truck. Two straps secured about the trucks and the stove tie the load, permitting it to be lifted, wheeled or pushed about. Handles of the trucks are on hinges so that they may be turned down. Thus, the stove may be wheeled up an incline to the delivery truck. The twin trucks are left on the stove, making it easy to unload at the delivery point.



Showing how twin trucks, shown in front of stove, are strapped on the load

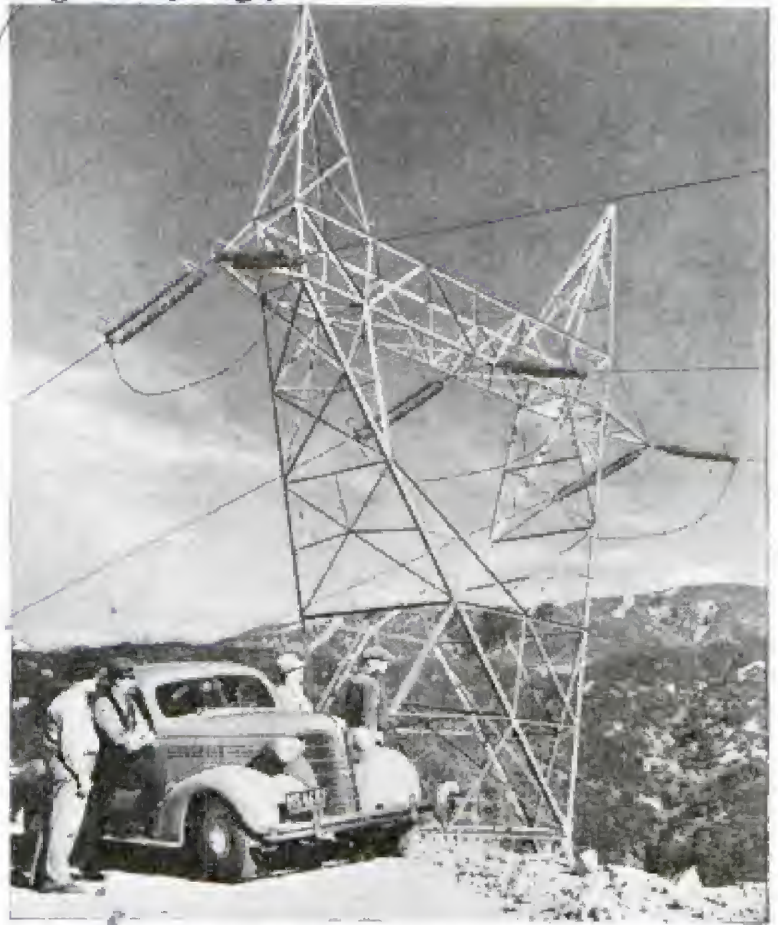
metal film on whose opaque surface  
Mr. Robert W. Carter.  
c/o Taylor-Sloane Corp

are strapped on the load  
Alvin and infro.  
Alvin and Carl Reed.



# It Takes Nerve to Patrol 266-Mile 'High-Line'

Responsible for maintaining a constant check on the 266-mile transmission line which carries power from Boulder dam to Los Angeles, Calif., thirty-four patrolmen drive their fleet of radio-equipped automobiles over one of the most exacting, most grueling roads in the world. A private highway built for servicing the power line, the road dips and twists through mountain passes, runs across miles of desert, sinks to an altitude of 100 feet, then rises abruptly to 5,000 feet, pounds over sharp gravel and wallows through hub-deep mud. Every hour of the day, the patrolmen push their cars relentlessly so that the flow of power may be uninterrupted. The "high line" is draped over a series of 2,700 steel towers, spaced several hundred feet apart. The road is split into seven sections, thirty-five to fifty miles in length. Patrolmen keep in touch with headquarters at Boulder and Los Angeles by radio.

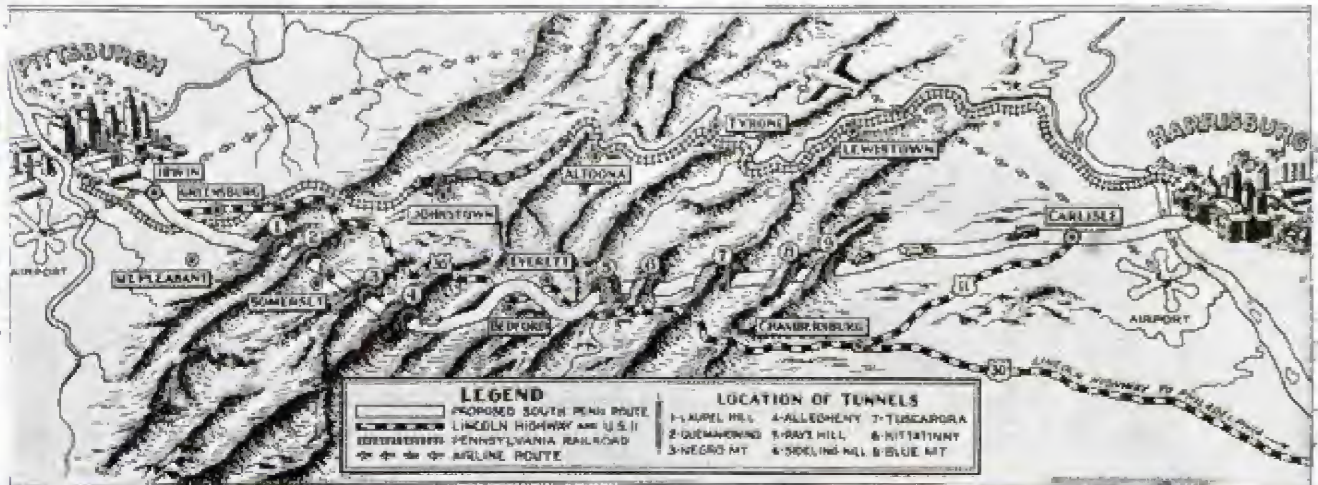


Here is the patrol car at one of the lofty stops along the "high line" road. This line carries 287,500 volts of electricity from Boulder Dam

## Super-Road under Mountains to Follow Old Rail Bed

Construction of a new superhighway through the mountains between Pittsburgh and Harrisburg, Pa., has been simplified by using an old railroad right of way for the road bed. The "all-weather" highway, seven miles of which will run through tunnels under the mountains, will

have no speed limit, no red lights and will not be exposed to foggy weather experienced in passing over near-by highways. Using the old railroad bed also eliminates crossing hazards on the 160-mile stretch. The highway will be paid for by a toll of one or two dollars per car.



Sketch shows how super-road passes through several mountain tunnels



## Duplicator Prints in Colors from Type or Writing



As many as sixty smudgeless copies a minute are turned out by this rotary duplicator

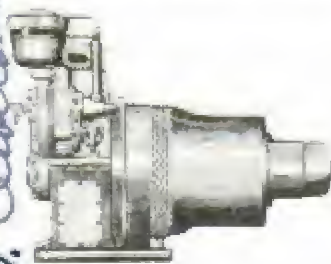
As many as four colors can be printed simultaneously by a rotary duplicator by means of special purple, green, red and blue carbons. Anything that can be written, typed or drawn can be duplicated on this office appliance by transferring the original to a master copy, which can produce seventy-five to 200 copies at a rate of forty to sixty per minute. There is no smudging or offset.

## "Baby" Diesels for Small Jobs Are Lightweight, Compact

Lightweight, two-cycle Diesel engines for the low-power field are being produced by General Motors. "Little brothers" of the giant power plants which drive

many high-speed passenger trains, the small engines extend in varying sizes down to a one-cylinder twenty-two horsepower model. Previously General

Motors had limited Diesel activities to production of larger two-cycle engines of 600 to 1,200 horsepower. The company also plans "packaged power" units consisting of the small Diesel engines and generators, in either stationary or portable



models, which can be set up quickly to power small industrial operations, theaters, hospitals, irrigation projects, parking lots and other developments. The engines also may be employed for any direct-drive prime mover operations, such as tractors, hoists, trucks and pumps. The line is being built in such a manner that additional horsepower may be obtained by the use of additional units. The production program includes two series of models, based on different cylinder sizes. The small engines have seventy-one cubic inches per cylinder, the other 223 cubic inches per cylinder. The small seventy-one series includes one, three, four and six-cylinder models rated from twenty-two to 160 horsepower. The larger series includes models rated at 200 to 400 horsepower.

## Vacuum Cleaner Used on Goats to Improve Sanitation

Animals on a modern goat farm in Connecticut are relieved of their dirt and dust with a hand vacuum cleaner. The owner says that this method of cleaning the animals improves sanitation of both the goats and their milk. Pastures and barns on the farm are models of sanitation and modern methods characterize everything, from breeding to producing the milk.



Here is the way the hand vacuum cleaner gets the goat's dust and dirt

Diesel Engine Unit: General Motors  
Diesel Corp. Cleveland, Ohio

49.50 for Chicago

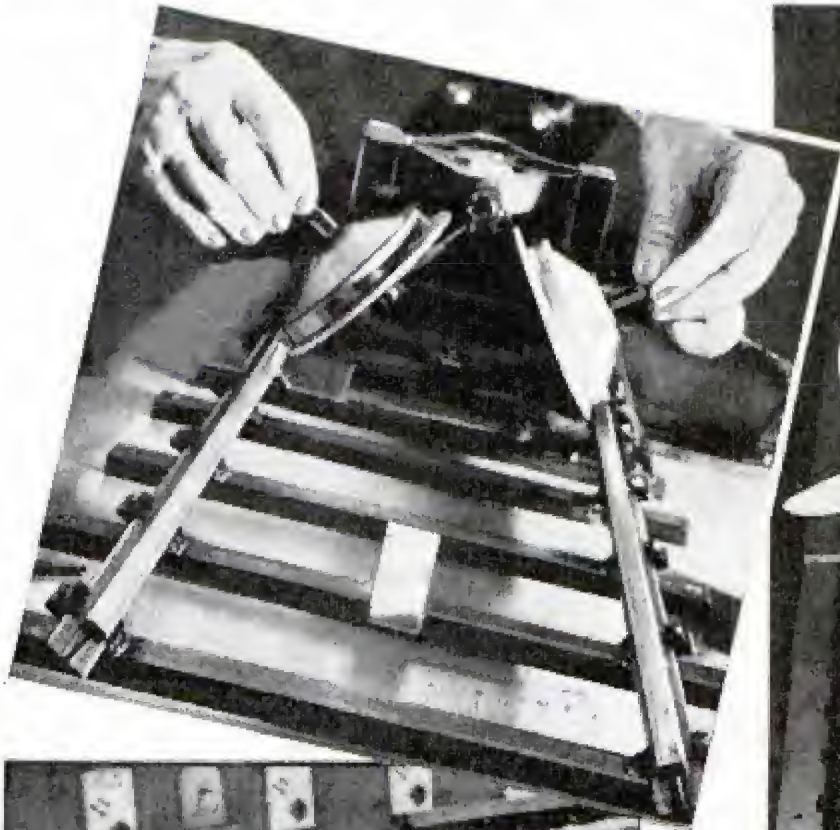
Keen-Kopy

Minkdale Farms, Stamford, Conn.

From Engineering News-Record



# Fast Train Runs on Model Super-Railway



Top, left, showing how train's wheels and rails are inclined inward. Right, propeller-driven car. Bottom, model of super-railway

drastic weight reduction, all wheels of the train, as well as the rails, are inclined inward about thirty degrees. This makes it practically impossible for the wheels to jump the rails and also allows a very steep banking of curves so that these may be taken at much higher speeds than hitherto possible. Two model trains built by Prof. Wiesinger are about four feet long. One is driven by a small gasoline engine, the other by a propeller and motor. The pitch of the propeller may be varied, permitting it to be used as an air brake. A model of the super-railway measures about 900 feet and on it speeds of seventy miles per hour have been reached by the rail cars, corresponding to a speed of about 230 miles per hour for a full-size car of like design. Built overhead, without interfering with property, the tracks for such a super-railway could be brought into the heart of large cities.

**P**RESENT conceptions of rail transportation may be changed completely as the result of a system devised by Prof. Kurt Wiesinger of Zurich University. A scale-model one-car train constructed by the professor weighs about one-fifth, inclusive of freight, as much as a present-day railway car. In order to prevent derailment which might be caused by such a

*Technical Lecturer,*



## Revolving Shelves for Store Allow Access to Stock



By twirling the shelf, the druggist brings to the front any bottle or package he is hunting

Revolving shelves built into the wall as cylinders rotating on a steel axle save valuable space in a western drug store. This method affords easy access to the stock, too, for the druggist can simply twirl the cylinder and reach any bottle he is hunting. The cylinders are seven feet high and have a diameter of two feet.

## 'Garlic' Odor Changed into Light Similar to Sunshine

Lighting engineers have found that tellurium, a semi-metallic element which produces a "garlic breath" if inhaled, gives off a continuous spectrum like sunshine. Three Westinghouse research men have been experimenting with tellurium vapor as an artificial light source. The tellurium was given a demonstration in an inverted U-shaped bulb equipped with a reservoir containing neon gas, which was used as a starter. The bulb is made of quartz because glass would not withstand excessive temperatures developed in the liquid tellurium and would turn black. A reddish light glowed in the bulb as the direct current was sent through the electrodes. That was from the neon gas. As the temperature moved upward the red lines of the neon light disappeared, absorbed by the

tellurium. Then a blue-white glow appeared, changing to a golden yellow as the hot tellurium vapor gave off a continuous spectrum like that of a hot solid. At one stage the light was nearly a pure white like sunlight. Within a few minutes the glow ran the gamut of the spectrum by a gradual change, instead of giving off the separate spectrum lines of individual colors emitted by most shining gases, such as neon. When the lamp burned the brightest, the temperature at the electrodes varied between 1,300 and 1,500 degrees Fahrenheit, two and one-half times hotter than molten lead. The research men said that if the problem of heat can be solved, the tellurium lamp some day may bring the natural beauty of flowers indoors, by the artificial duplication of sunlight. They indicated that the lamp may be used for decoration of the home of the future.

## Non-Skid Tires Date Far Back to Chariots of 2800 B.C.

As long ago as 2800 B.C. non-skid wheels were invented. The Iraq Expedition of the University of Chicago's Oriental Institute has discovered a copper model, only three inches high but done in careful detail, of a Sumerian war chariot of that period. Its wheels were "milled" with copper studs, probably for the same reason that automobiles and trucks today use chains, lugs and non-skid tires.



Photo courtesy Oriental Institute, University of Chicago  
Notice the copper-studded tread on the wheels of this three-inch model of an ancient war chariot



# Plane's Lifesaving Aids Are Inflated with Gas

Gas used in making ice-cream sodas is employed to inflate lifesaving equipment devised by the U. S. army air corps. The equipment includes a life raft for airplane crews, "water wings" for planes forced down on the water and a "horse collar" that will keep a man floating for hours. The life raft is entirely automatic. The pilot pulls a lever, causing the raft to inflate and fall free of

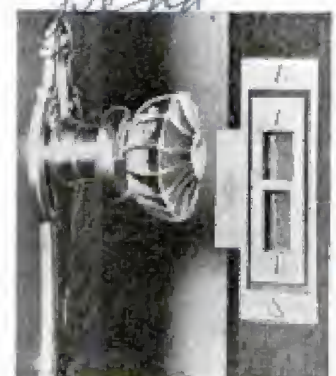


Top, left, the "horse-collar" life-saver in position. Right, using gas-inflated raft. Center, plane's water wing. Bottom, gas tube for inflating equipment

then flows into the tank, replacing the fuel. Then the valve closes and the gas floats the ship. The horse-collar lifesaver is so designed that even if a flier is thrown out of his ship unconscious, he will float, face up, for a long time. His equipment also is inflated with the bottled gas.

## Adjustable Lock-Strike for Door Takes Up Shrinkage and Sag

There is no need for calling the carpenter when doors begin to sag, shrink and rattle if you have installed the adjustable lock-strike marketed recently. The old method was to have a carpenter move the strike, which left a fresh cut on the door jamb that required plugging and painting. Anyone can adjust the new type lock-strike by moving its center plate vertically or horizontally and then tightening the set screws.



the plane within a few seconds. It is housed in the fuselage, behind the pilot's headrest. The water wings, concealed within wing panels, are inflated automatically through the action of water pressure on a valve in the wings. The valve releases carbon-dioxide gas, which provides the pressure required to pull out pins fastening the compartment. In larger planes the fuel tanks are utilized. Built into the wings, these tanks are constructed so that carbon-dioxide gas, inert and noninflammable, opens the gasoline dump valve and

Florida High Co.  
517 1/2 Hallmark Ave  
Danville, Va



# TURNING NIGHT



Top, softball game in progress. Illumination totals 39,000 watts, enough current to light forty homes. Bottom, huge sun are used in special lighting



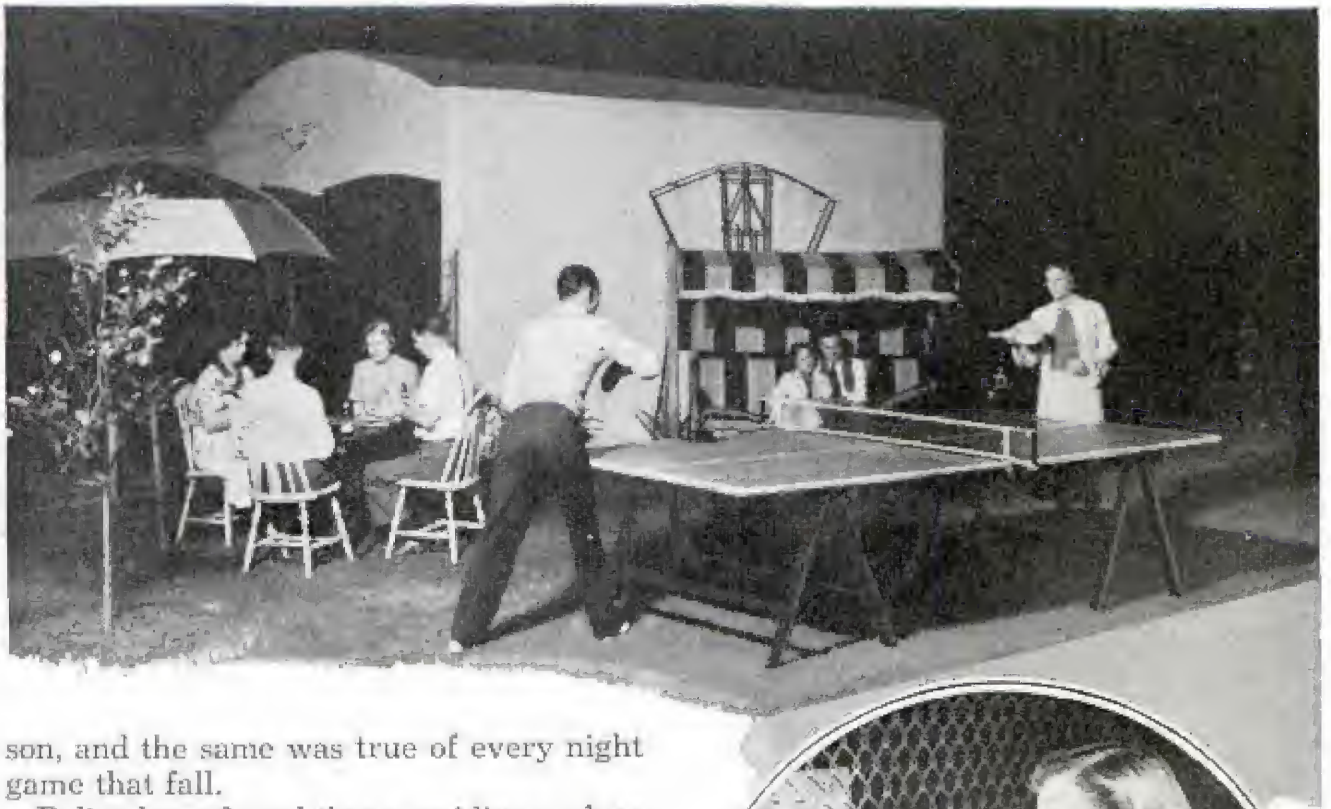
**B**EHIND the glare of the huge "inkies" that turn night into day for sports, you'll find men accustomed to using light on a big scale. They pour it on by the thousands of watts, drenching hockey rinks, golf driving ranges, bowling greens, and even horseshoe tournament grounds with a brilliance like noonday.

After-dark sports are coming into their own. Nowadays, no town is too small to

have its own night playing field. One Oregon village of 2,600 population recently spent \$12,000 on lighting equipment for a hardball field. Another hamlet of fewer than 1,500 built a softball field that drew crowds from the surrounding farming region. Within one year, cash admissions rolled up enough money to make the town's football field one of the best lighted on the Pacific coast. Kern County, in California, built a night softball field which proved so popular that soon the number had grown to twenty-seven, each the nucleus for a complete night playground to be built later. One high school changed to a night football schedule because ranchers near by couldn't get away during the day, and on Saturdays, conference college games drew the fans. Gate receipts from the first game netted more than the entire preceding sea-



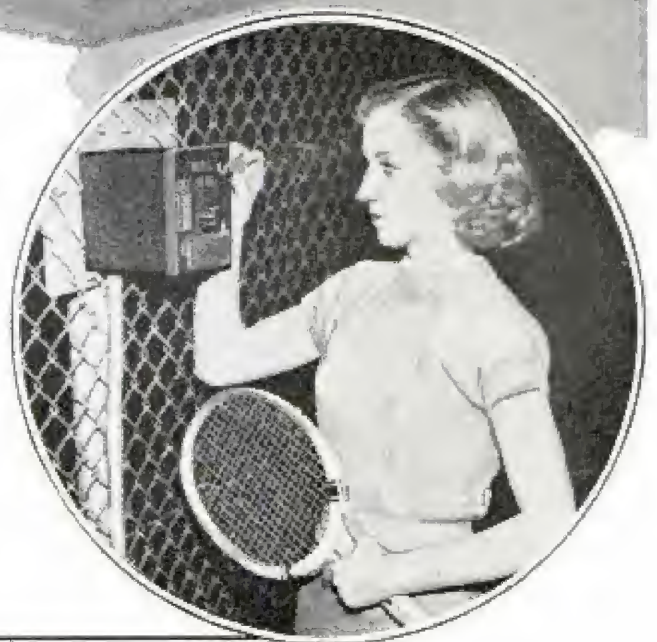
# INTO DAY



son, and the same was true of every night game that fall.

Police have found that providing a place for clean night sports lightens their worries. One city cut its juvenile crime one-third by setting up a series of lighted playgrounds. Los Angeles has a large network of recreation centers equipped for many kinds of night sports. Tennis fans can have the use of a well-illuminated court by putting twenty-five cents into an automatic slot machine which turns on the floodlights for thirty minutes.

Two cardinal rules for sports lighting are: "Always light the ball," and "Keep



Top, playing table tennis under the "inkies." Center, dropping twenty-five cents into meter provides light for thirty minutes on tennis court.

Tennis courts with floodlights turned on for night play  
 Lighterog installations  
 Electric Mfg. Co. Westinghouse  
 East Pittsburgh Pa 723





*San Bernardino*  
Top, view of a California baseball park brilliantly illuminated for night game. Note how the light is directed from each lamp. Bottom, control panel for announcing and broadcasting night sports events in stadium

glare out of people's eyes." The first calls for individually set reflectors, tailored to fit the needs of the game. The second usually is a matter of putting the lamps so high that the light falls nearly vertically, like natural daylight.

High brilliance for night sports is obtained at Los Angeles' Gilmore Stadium through use of large numbers of high-powered incandescents, or "inkies," mounted around the rim of the stadium on high poles and focused to give a uniform flood of light. Sixty such units, each a big 1,500-watt lamp mounted behind a lens ground to narrow the beam vertically, but widen

it horizontally, burn at ten per cent over-voltage to give an intensely white light. On the field it's so bright you may read a newspaper. But Tom Curtis, lighting expert, is adding more "top light" to boost to 105,000 watts, enough current to illuminate more than 100 average-sized homes. That means that in baseball, players will stand out clearly against the field.

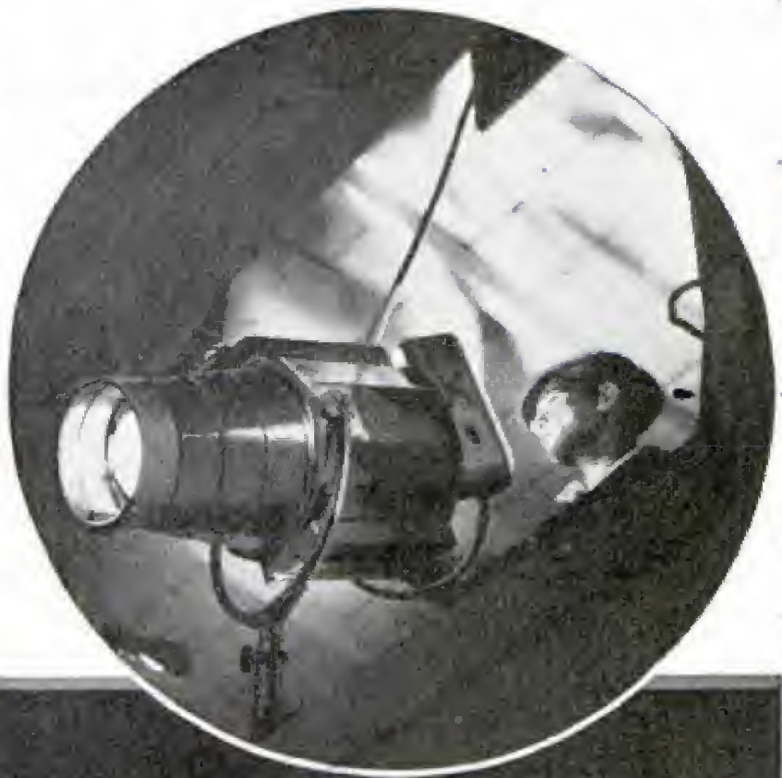
Many early lighting systems were unsatisfactory because of a low "ceiling." Now and then the ball would rise beyond the level of the floodlights and disappear. To lift the ceiling, Curtis will add another 30,000 watts at the bases of the poles, directed upward. That paints the under side of the ball and helps the fielders when a high fly is struck.

In case of a foul tip or a hot grounder, an extra group of five 1,500-watt units with diffusing lenses banked opposite first base will brighten the ball. Additional groups of five will be placed near third base and home plate for the same purpose. Still others will illuminate the outfield from the fielder's angle.



Getting ready for a game doesn't mean that the electricians can simply walk out to the field and turn on the lights. Every unit must be cleaned, tested, and focused frequently. Formerly the big floodlights were lined inside with heat-resistant glass reflectors like those used in battleship spotlights. But under the intense heat, huge blisters the size of goose eggs would raise in the glass and finally burst. Now a specially polished, spun aluminum reflector which resists the high temperatures is used. Other types are of brass, chromium-plated.

Each sport requires a different



Top, one of the "juicers" spotlights a sports event.  
Center, stadium illuminated for night auto race

set-up and to change over takes about eight hours. To build up the light evenly all over the field is a ticklish job. Each reflector must be adjusted individually to eliminate "ghosts," dark spots that really are black images of the lamp's filament. Then you turn a light on one spot and throw other lights to wash out the shadow. When this is accomplished, you walk about the field. Everywhere you go, you cast faint shadows evenly in all directions.

The settings are double-checked over the entire field with a photoelectric meter,

(Continued to page 150A)



Adjusting floodlights sixty feet in the air

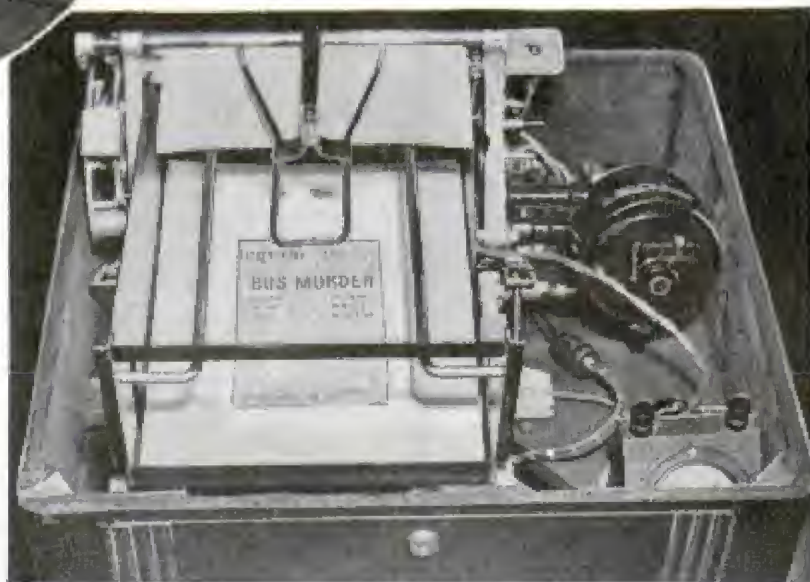


## Newspaper Sent into Home by Facsimile Radio



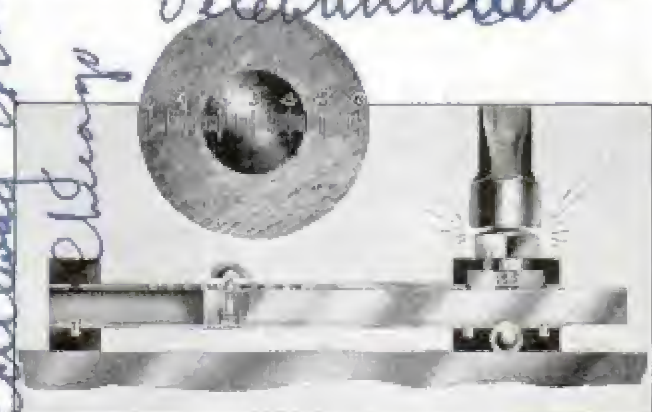
**Circle, reading facsimile sheet of newspaper. Right, cabinet receiver. Bottom, interior of receiver, showing sheet of news received by the facsimile method. Each sheet is cut off and dropped into tray automatically after completion of reception.**

Prospects are that radio delivery of facsimile newspapers directly into the home may be a reality in the near future. Only perfection of certain technical details stands in its way, according to radio experts. Broadcast licenses for this field already have been issued. The perfected system will permit reception of the newspaper on a machine during the night. Present equipment transmits and receives pages the size of the standard letterhead. As each page is received, automatically, the receiver cuts it off and drops it into a tray. Next morning, the owner reaches



through a door of the receiver's cabinet and takes the sheets out. In order, the sheets comprise the newspaper. Facsimile radio has been used commercially.

### Test Bar Measures Metal Hardness by Hammer Blow



**Dents in two metals are compared to test hardness**

Testing metal for hardness is reduced to a simple arithmetical problem by means of a "yardstick" just devised. Conveniently small, this measuring stick can be taken into the field for tests of railway rail ends, high-pressure pipes, welded joints and similar metal parts which cannot be sent to laboratories for inspection. The device consists of a short metal bar of known hardness, which is laid over the metal surface to be tested. In direct contact with the under surface of the bar is an impres-



sion ball. When an anvil exactly above the contact point of this ball is struck with a hammer, the impact is transmitted equally by the ball to the test bar and the metal undergoing test. The diameters of the impressions on these two surfaces are exactly relative to the hardness of the two metals, and by measuring the impressions with a microscope and applying an easy arithmetical formula the hardness can be figured quickly.

H 82.

### Squad Car's Cable-Claw Catches Fugitive's Auto

Crowding fugitive automobiles off the road at risk of injury to police and law violators would be eliminated by a device, attached to the front of the squad car, which grabs the rear bumper of the fleeing auto. The device consists of a self-fastening claw, a steel cable and a drum, all contained in a unit attached to the front cross member of the police car. In action the police car is driven up behind the fleeing auto until the claw touches the rear bumper, releasing a catch. The claw drops and snags the bumper. Then the police car drops back a few feet, unreeling the cable and controlling it by means of a brake on the drum. Application of the police car's brakes halts both cars.



Demonstration of how fugitive car is halted by claw-and-cable on police car and how suspect may be captured easily

### Folding Mattress in Sleeper Provides Room for Dressing



Sleeping car bed folds up on hinged metal sheet, allowing passenger standing room and a seat while dressing or undressing

Mattresses that fold vertically, leaving ample dressing space in the section, are the latest convenience being installed in Pullman sleeping cars. Instead of using the two seats to support the bed, one seat is left in its usual place and a metal sheet

is laid across to hold the mattress. This light steel sheet is hinged, and while the passenger is dressing or undressing it is strapped to the mattress and bedding and raised to the vertical position. Thus there is not only standing room but a seat for the passenger's comfort. When ready to retire he can stand behind the curtain and lower the bed. This arrangement is to be made available when a passenger occupies the entire section.

608 American Band Play

clw. J. W. Thompson



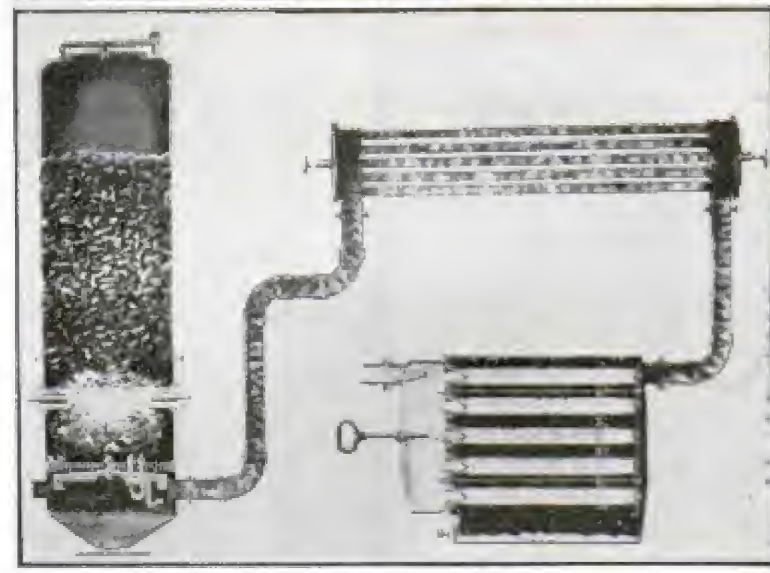
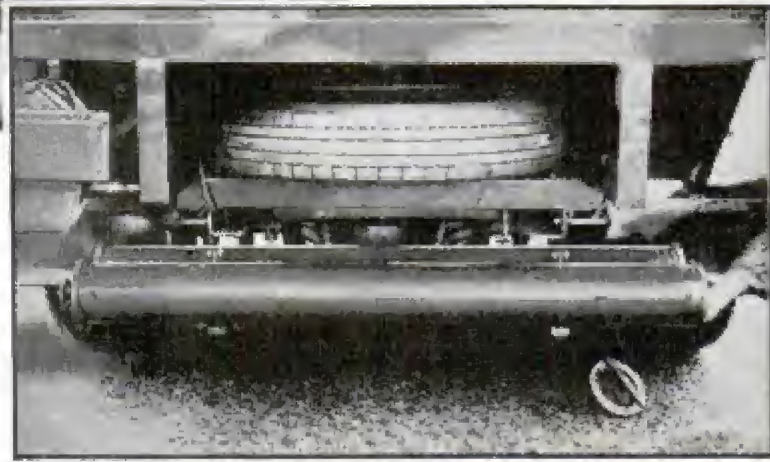
no answer to letter 6/29/38

#120

# French Truck Runs on Wood or Charcoal Gas



Top, testing flame before starting motor. Center, gas cooling tubes at rear of truck. Bottom, showing how gas is generated and flows through cooling tubes and purifier to the motor



Realizing that war might bring interruption of their gasoline-operated truck and bus service, the French are hunting a substitute fuel. As a result, they have developed a means of running vehicles on gas generated from wood or charcoal. The apparatus consists of a burner, a cooler and a purifier. Once sufficient gas has been generated for a start, the vehicle may be started like any other fitted with an electric starter and carburetor. The equipment has been tested on light trucks and on passenger buses. Before starting the motor, the operator tests the quality of the gas. The motor is ready to run within six minutes after the fuel has been ignited. The generator is simple. On one side is the burner, connected to a gas cooler and to the purifier from which gas is fed to the motor.

## "Hypo" Pollinates Pine Cones at Tree-Breeding Station

Faced with the fact that our forests are being used up three times as fast as they are being replaced, scientists at a California experiment station are endeavoring to breed faster growing trees that will resist insects and fungi and thrive in different climates. In crossbreeding pines to develop better strains, they cover the female flower or cone with a canvas bag which

has a celluloid window to permit observation. Then the catkins are taken from the desired parent tree, dried and shaken in a tight container and given a germination test. Finally the pollen is introduced into the bag covering the female cone by means of a sterilized hypodermic needle and syringe. By this fertilization scheme the forest station is developing healthy trees

No further information

Compressed Air May Jan. 1938

constitute of Forest Sciences



to meet the specifications required by various industries — construction, furniture, box manufacture, wood-pulp. Less than one-sixth of the original forested area of the United States remains today, and the virgin forests are being decreased every year at a rate of twenty-five billion cubic feet of wood.

H 157

### Pump Fills Tractor Tank from Barrel without Spilling

Buckets, funnels, faucets and the attendant danger of spilling gasoline on a hot engine are eliminated by a fuel pump developed by a farmer for filling tractor tanks. The pump is at the spout end of the hose, so that the tank can be watched as it is filled. A brass tube attached to one end of the ten-foot hose is dropped into the top of the fuel barrel and the seven and one-half pound pump, at the other end, is held in the hands while pumping. The pump can fill the average tractor in two minutes. It primes itself even when dry.



Refueling a farm tractor with hand pump controlled at spout end, reducing danger of overflow

## Cast Uses Studio's Dead End for "Outdoor" Sound Effects



This is no broadcast of the stage play, "Dead End." The actors are using the non-resonant "dead end" of studio to simulate scene in open air

Dead end means outdoors in the broadcasting studio of station WBBM, Chicago. When the script calls for a scene out of doors, actors and "mike" move down to the non-resonant dead end of the room, where walls and floor are treated to prevent any rebound of sound and the effect over the radio is that of open air. When the scene shifts indoors the microphones move to the live end of the studio, and you notice the resonance in the reception.

¶ Popular Mechanics Magazine can furnish the name and address of the maker of, or dealer in, any article described in its pages. If you wish this information, write to the Bureau of Information, inclosing a stamped, self-addressed envelope.

Sheldon Tractor  
Bill C. Cunningham

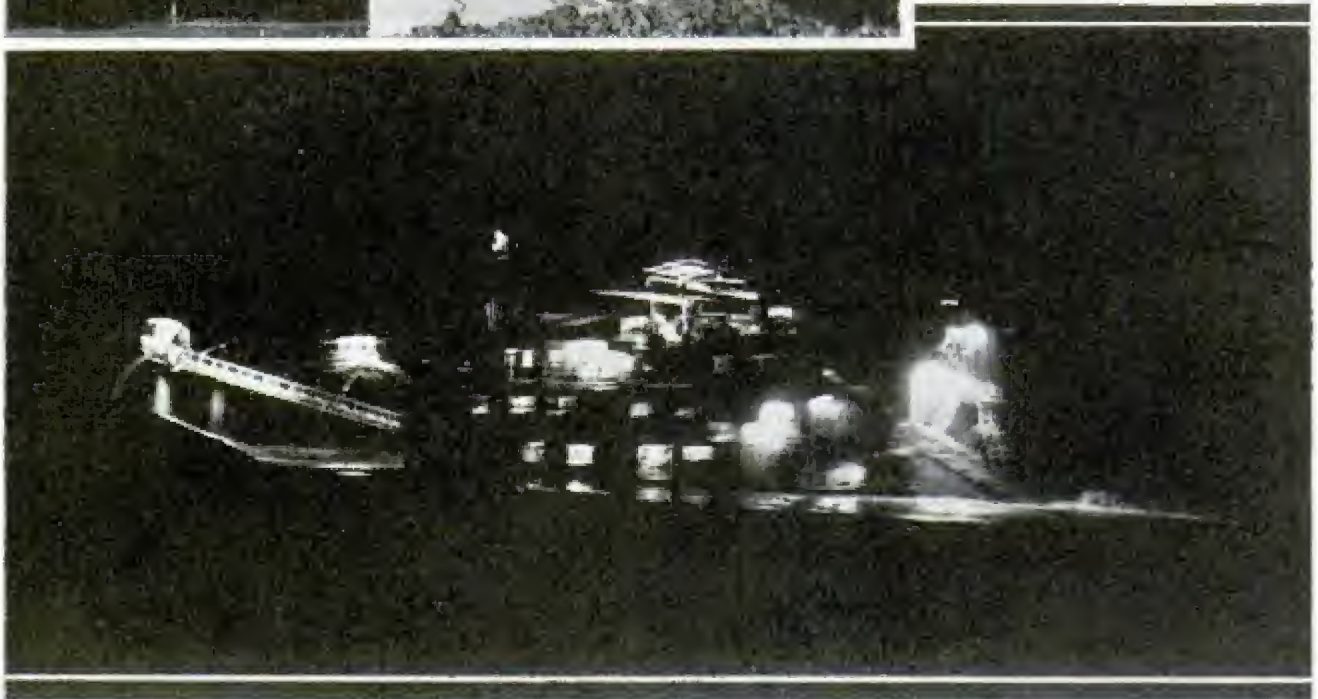


# FLAGSHIPS *of the*

NEARLY one-third of all the gold mined in the west comes from ground so poor that you could sift through it for hours without finding a flake of the yellow metal. You might earn ten or twenty cents a day working the ground by hand. In a cubic yard of sand and gravel you might find one three-hundredths of an ounce, worth about a dime.

Yet this kind of ground is yielding fortunes every year. Mining engineers have developed a monster machine unlike anything else in the world, a giant dredge that scoops up thousands of yards of material every day to sift through it and find and save every tiny particle of gold.

These great gold boats have been assembled at the tops of mountains and "sailed" downstream a few yards a day, eating away at the deep gravels of old river beds until they finally arrive in the lowlands again. The Cali-



*Top, bow gantry of giant gold boat, showing digging ladder raised to start new cut. Bottom, night view of a gold-dredging machine. These big machines weigh 2,200 tons*

*cont. Thomas & Stinson, Jr. 10555 / Holman Ave. Los Angeles Calif. 51551*



Reference: A. L. James, Esq. 1851  
Natoma Co, Nevada Bldg  
**GOLD FLEET** Sacramento, Calif



fornia type dredge, known all over the world, is so efficient that it is being used on every continent where large quantities of low-grade material are found. These dredges have been flown piecemeal through the air and assembled in the almost impenetrable interiors of New Guinea and Africa. The boats are recovering platinum in Russia, tin in Malaya, and are at work in Alaska, Chosen and South America.

The thing that strikes the casual visitor as almost ridiculous when he watches a gold boat in operation and witnesses the weekly "clean-up" is that the tremendous dredge, costing half a million dollars, weighing 2,000 tons or more, and employing up to eighteen men in three shifts, works night and day for a full week and produces material hardly bulky enough to fill a cigar box. To get even this small amount the boat may have sifted through 90,000 cubic yards of gravel during the week. But the small gold brick that is melted down from the cleaned-up material every Saturday is worth \$10,000 or more.

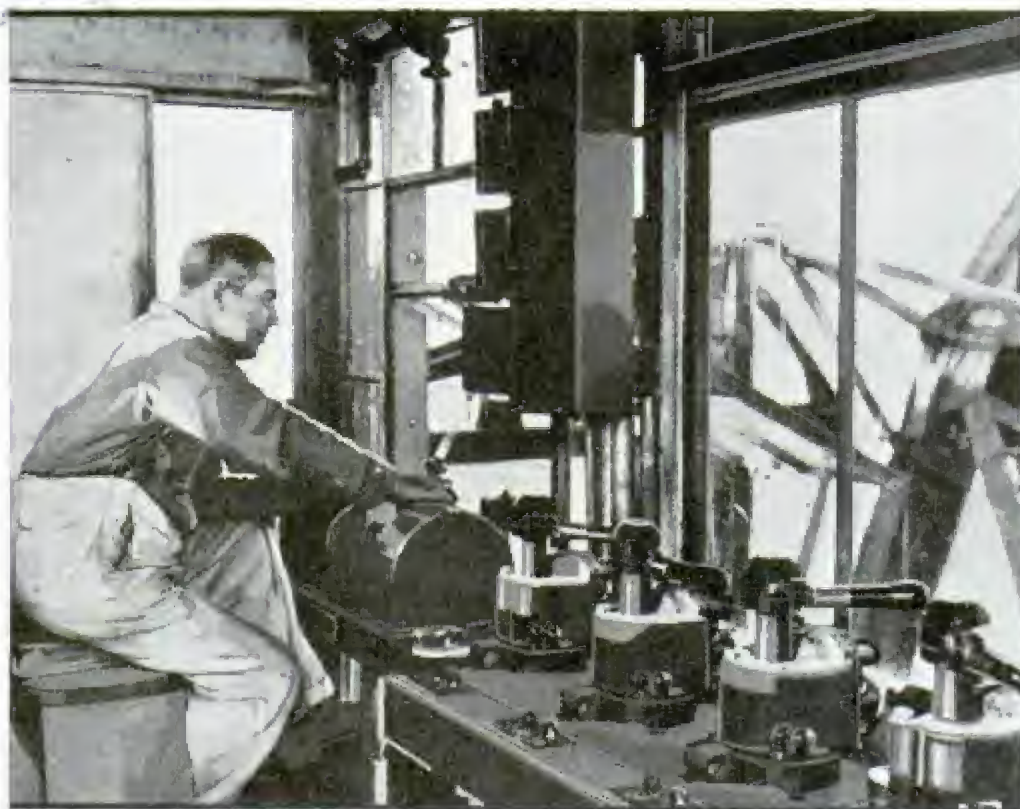
Old river channels with bed-



Photo by Auto Club of So. California

Top, gold boat, digging ladder at right and long stackers at stern discharging material after gold has been recovered. Bottom, portable dry washer with which small amounts of gold may be recovered from rich earth



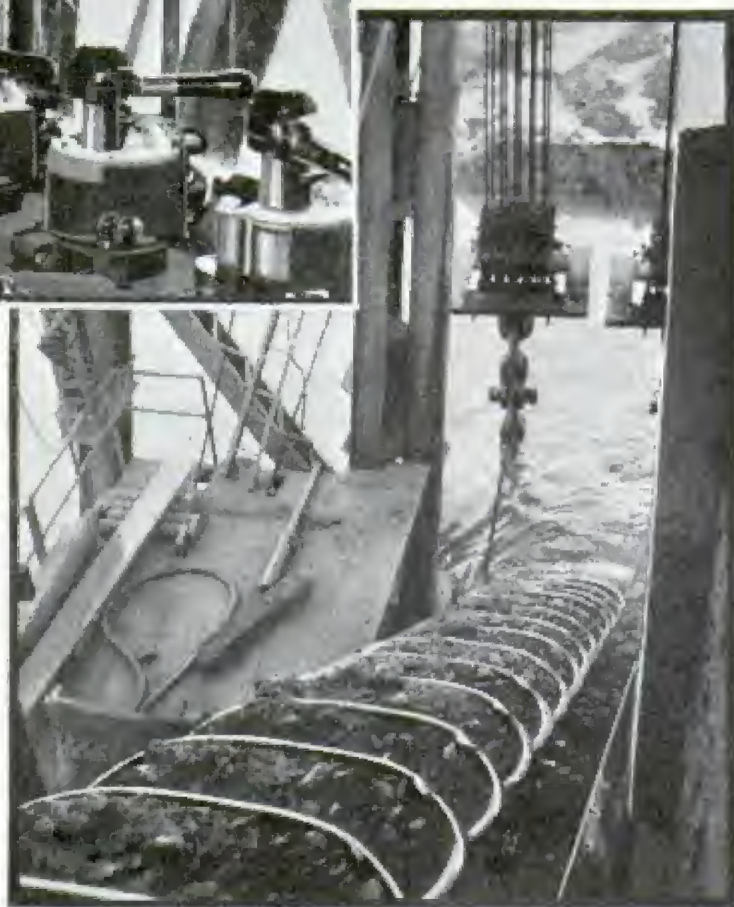


*Left, winch room overlooking digging ladder contains controls for operating gold boat. Bottom, view of digging ladder from high in the boat*

rock as deep as 100 feet below the surface, are one kind of formation in which the big dredges can make money if small amounts of gold are present, either scattered all the way through the ground or concentrated in a thin layer on top of the bedrock.

One gold-bearing area in California, not many miles from where Marshall discovered gold in 1849, is thought to be a piece of old sea bed instead of an old river channel. The gold particles found there range in size from pin points to pin heads and not even the best gravel in the area contains much more than twelve cents worth of gold per cubic yard. Yet half a dozen gold boats have been at work there for years, steadily chewing down into the ground. Due to the tremendous quantities that a dredge can handle, the total costs of operation may not amount to more than four cents per cubic yard, leaving a good profit even with poor ground.

On board the "Natomas No. 1," "flagship" of the Natomas Company's fleet of six dredges in the vicinity, the operator in the winch room high above the digging ladder controls all the operations of the vibrating, roaring vessel. The bow of the boat sweeps back and forth in 150-foot arcs, the line of buckets far below the surface cutting steadily into the gravel and sand. The 2,200-ton boat, as large as many an ocean freighter, is moored in its own artificial



lake and 750 gallons of water per minute are fed into the lake from the company's own canals.

There are sixty-five buckets on the digging ladder, revolving up and down like an endless chain to scoop up the material and dump it into a big hopper on the boat. Each bucket weighs two tons and has a capacity of sixteen cubic feet. Variable speed motors permit the bucket line's speed to be varied through a digging rate of from eighteen to forty buckets per minute, allowing faster digging in soft ground. Direct-current motors totaling 12,000 horsepower are installed on the boat for



operating the different drives. Incoming gravel that is discharged into the hopper on the boat feeds into a long revolving cylinder with perforated walls. This trommel is nine feet in diameter and thirty feet long, and powerful streams of water from monitors are pointed into it to break up all consolidated material. All the large stones and rocks fed into the cylinder are discharged from its lower end while the finer materials, up to a half inch in diameter, pass through its perforated wall.

These fines and the flowing water fall into long slanting troughs under the trommel. All of the heavier particles in this moving material are caught behind riffles or cleats fastened across the bottoms of the troughs. To assist in catching every particle of gold, small amounts of mercury are placed behind the riffles to absorb and hold the gold flakes as they drift down. The combination of gold and mercury, called amalgam, is scraped out every week.

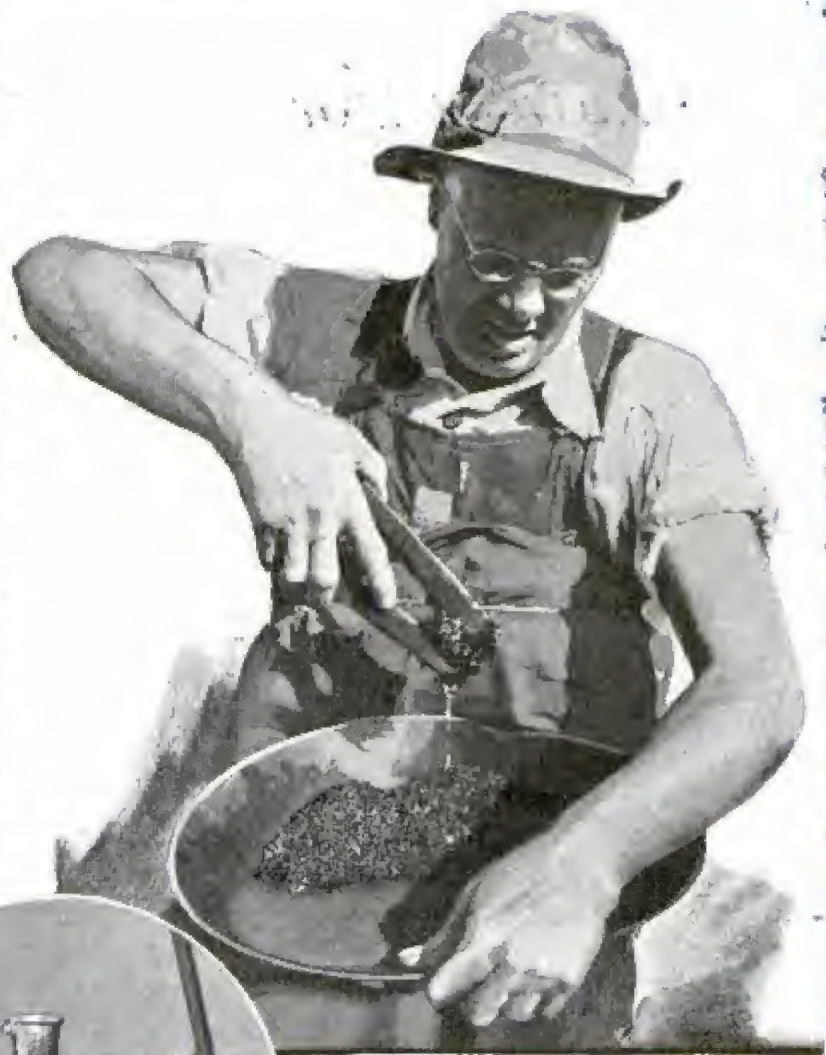


Photo by Auto Club of So. California

*Top, magnetic iron particles trapped behind riffles of gold-saving machinery. Center, vial containing platinum recovered by gold dredge. Bottom, prospector panning ore he has crushed with mortar and pestle to learn gold content of the rock*



By the end of a week's operations this amalgam is about half gold and half mercury. It looks like a lot of crumpled-up tin foil. To separate the two elements the amalgam is placed in a retort and the volatile mercury is distilled off, being collected for re-use with a water condenser. The spongy gold left in the retort is melted down and poured into small molds.

When the material that the gold dredge scoops up has passed through the gold-saving equipment it is moved onto endless belts at the stern and is carried out to the ends of long stacking booms to be discharged behind the boat.

Gold dredges have two heavy

(Continued to page 141A)



## Plastic Box at Front Door Lights House Number

*Cleveland Ohio*



House numbers show up clearly against lighted box made of sheets of a translucent plastic material

In a neat, translucent frame that harmonizes with the modern architecture of his new home, a Cleveland man has mounted his house number, illuminated so that it can be read easily from the street. The numerals are six inches high, of sheet bronze; the surface of the six-foot case is of synthetic resin in sheet form. Only a three-watt lamp is required to light the number. When the entire box is illuminated, three lumiline lamps are turned on.

## Filing Spindle Comes Apart for Removal of Any Paper



Any memorandum or bill may be removed from a filing spindle that comes apart. When a paper is to be removed, it is pressed down on the bottom part of the spindle while papers above it are lifted

off with the top portion of the spindle. This leaves the desired paper in position for easy removal. It is possible to reverse the spindle pin so that the papers first placed on the pin will be on top. This means that the items on the spindle may be withdrawn in the order in which they were filed. The point of the spindle is rounded.

## Forty-Foot Trailer Forms Mast for Oil-Field Work

For pulling rods, tubing or casing in wells not provided with a servicing derrick, a forty-foot trailer forms a mast in the oil fields. The trailer's frame is A-shaped, and is combined with an axle and a pair of wheels. Since the wheels are twenty feet in the air when the mast is in use, they do not interfere with work. Rigid tie-in of wheels to frame makes a vehicle which can be transported from one well to another quickly and safely.



Trailer mast in place for oil-field work. Note position of the wheels

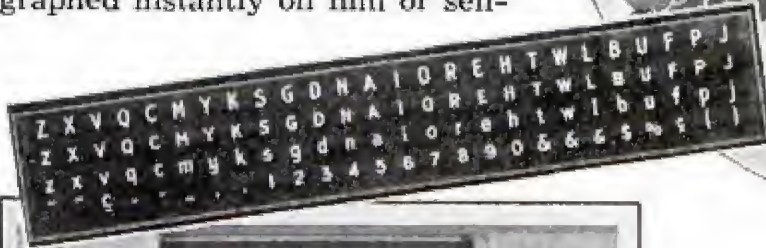
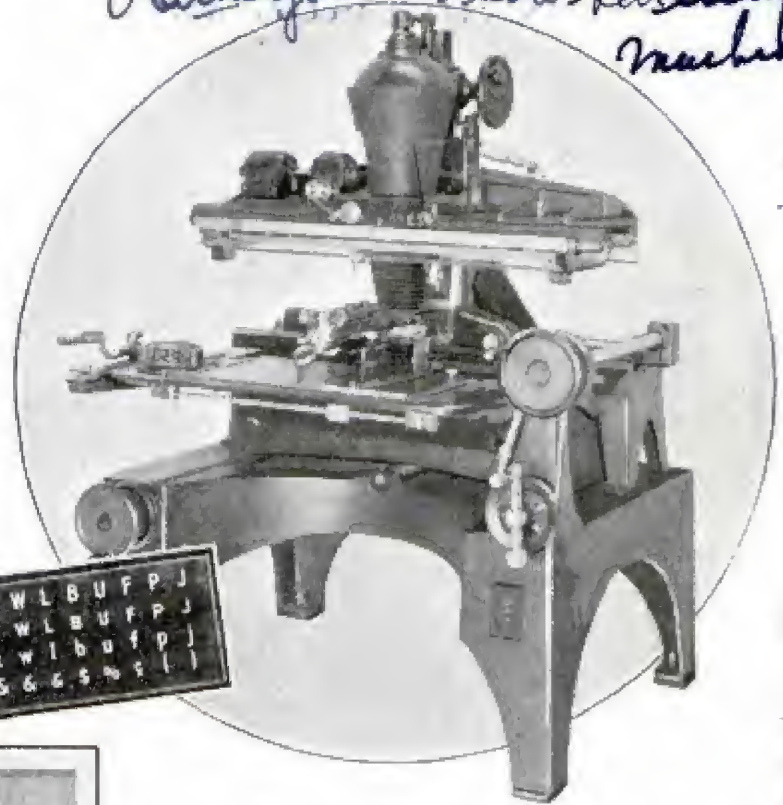
*E. C. Markham*

*Depository: Filing Spindles, Chicago  
In F. Pindar's, as per in miniature  
lamps, renewal electric & new Park*

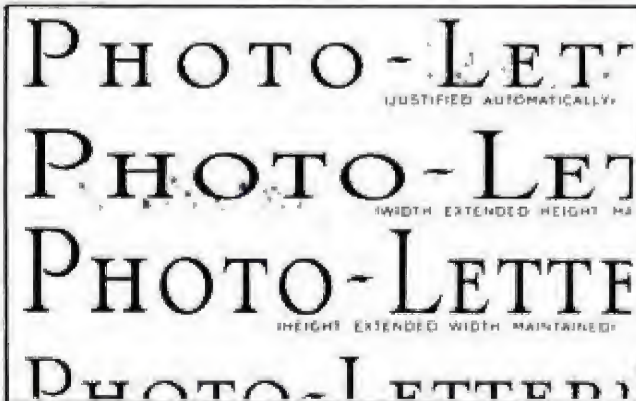


# Robot Artist Imitates Hand-Lettering by Photo

Typesetter that uses no type, artist that uses no pen, the latest instrument of the printer and lithographer is a mechanical artist which operates photographically. It produces an effect of hand-lettering or fine typesetting, but instead of type it uses master alphabet plates—glass plates of transparent letters which slide back and forth semi-automatically, bringing one letter after another into focus over a small precision camera. As each letter comes into position it is photographed instantly on film or sen-



Top, the photo-lettering machine. Left, a master alphabet plate and layout board, and below, variations produced by machine from one master alphabet



sitized paper. The operator, working in daylight, visually controls the mechanism with a layout and arranges the letters exactly where he wants them. This method is not intended to do the work of the Linotype, but to arrange layouts which ordinarily would be handset or lettered by an artist. The photo-lettering machine will expand or condense the letters, stipple, screen or shade them; by changing focus it can produce any size from small text letters to giant headlines. Lines are auto-

matically justified, and trademarks, signatures, borders and repeated designs can be stepped up or reduced in any size and arrangement. More than 200 styles of master alphabets are available, and by using the condensing, italicising and other features about forty different type fonts can be reproduced from a single master plate.

14126

## Adjustable Knife Slices Cheese to Any Thickness Desired

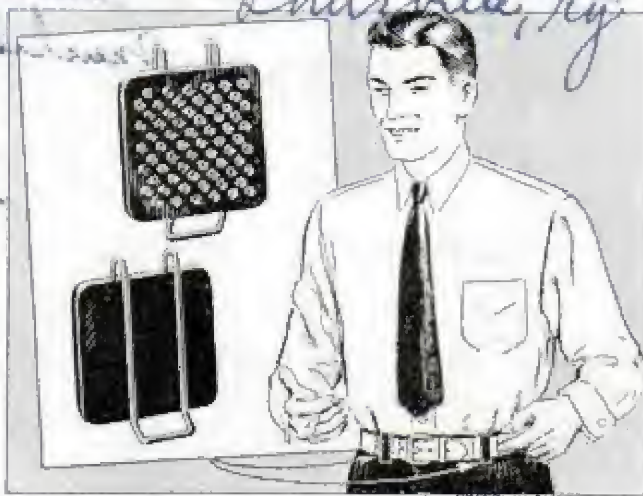
Cheese can be sliced to the desired thickness with an adjustable knife which also acts as a server. The hinged blade is set to the angle at which it cuts the proper slice, and then its sharp edge is drawn through the cheese, slicing it and laying it in a position for serving. The knife may be used similarly for serving butter.



As M. Thurnauer Co.  
14126



## Anchor Pads at Trousers' Top Keep Shirt in Place



Two views of anchor pad, with drawing of manner in which it is attached

Made of rubber, anchor pads to be inserted at the top of trousers to keep the shirt in place are on the market. The rubber side is against the shirt. A wire clip attached to the pad extends over the top of the trousers and around each belt loop. Then the belt is inserted over the clip and under the belt loop.

## Secrets of Skidding Revealed by 20,000 Tests

After 20,000 tests on skidding tendencies, it has been found that regardless of tire tread design, adhesion between road and tires decreases with the speed of the vehicle, reducing resistance to skidding and increasing the difficulty of bringing the automobile to a stop in an emergency. The tests, conducted under the direction of Professors K. W. Stinson and C. P. Roberts, also revealed that a light sprinkle causes the average road to be about one-

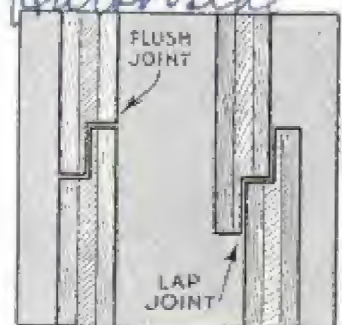


Trailer with which skid tests were made. It has one-wheel hydraulic brake

third more slippery than a drenching rain; that sliding the wheels of an automobile when applying brakes results in the vehicle traveling much farther before it is brought to a stop; that tires which have been worn smooth may as much as double the tendency for wheels to slide when brakes are applied, and that increasing or decreasing tire pressures on ice or in snow does not help traction. In the tests, a two-wheel trailer, with a Linderman hydraulic brake on one wheel, was used, the other wheel running free. The trailer was attached to a tow car through a diaphragm connection which translated the effort required to pull the trailer into hydraulic pressure. The latter was recorded on instruments in the tow car. The type of brake and the particular installation made it possible to increase braking effort gradually and smoothly until the wheels locked and the tires slid. In every test on straight ahead sliding, the skidding tendency was shown to increase with the speed of the car. In some tests, as little as one-quarter the resistance to sliding was found at forty-five miles an hour as at five miles an hour, with the resistance to skid dropping off even faster at higher speed. From a car operating standpoint the tests would indicate that brakes which lock too easily are a hazard rather than a help in bringing the vehicle to a stop.

## Weatherproof Siding of Plywood Reduces Building Costs

Plywood siding, made weatherproof by its synthetic resin binder, is being introduced as an inexpensive building material readily adaptable to various architectural



effects. Faced with fir or redwood and available in four and eight-foot lengths with exposures of twelve and one-half to twenty-three inches, this plywood saves both original and maintenance costs. Its wide surface makes it inexpensive to install, reducing the nailing considerably; and the resin binder, poisonous to termites and rodents, stops the passage of moisture.

Warbur Plywood Corp.





# TEN-TUBE SUPER *of advanced design* . . .



SEVERAL unusual features are included in this inexpensive 10-tube superheterodyne receiver which is available in two models designed to meet the requirements of amateurs and short-wave listeners, as well as all-wave listeners who are interested in a communication-type set for DX reception on all

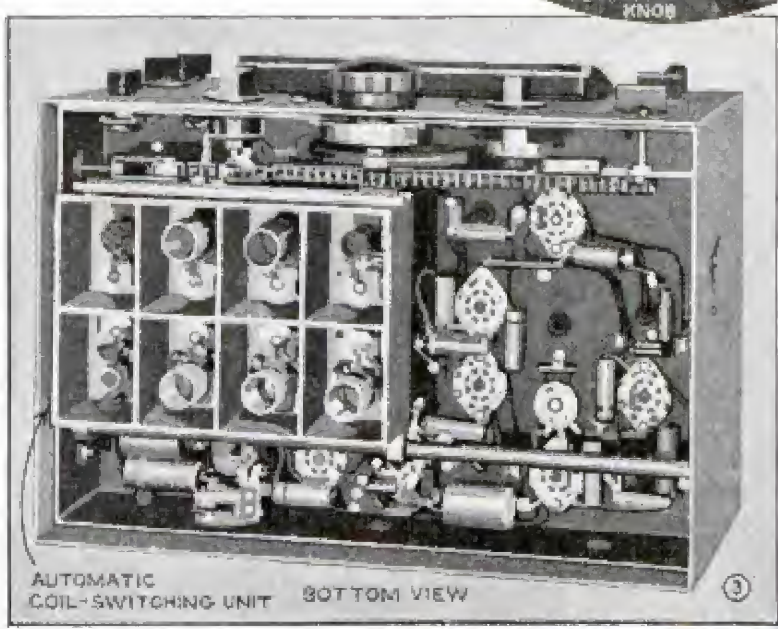


bands. The NC-81X model, shown in the photos, is fitted with a special tuning condenser and coils to provide full band spread on the 10, 20, 40, 80 and 160-meter amateur bands; frequencies between these bands cannot be covered with this model. For short-wave listeners and those who wish an all-wave DX receiver, the

NC-80X employs the same circuit, covering frequencies from 540 to 30,000 kilocycles in four ranges. This means everything from 10 meters to the top of the broadcast band.

Both of these models operate on 110 to 120-volt, alternating or direct-current, power lines. This a.c.-d.c. feature is of special interest to many Canadian readers and others located where direct current is employed. The same models are also available for battery operation where no 110-volt line supply of any kind is within reach.

(Continued to page 136A)





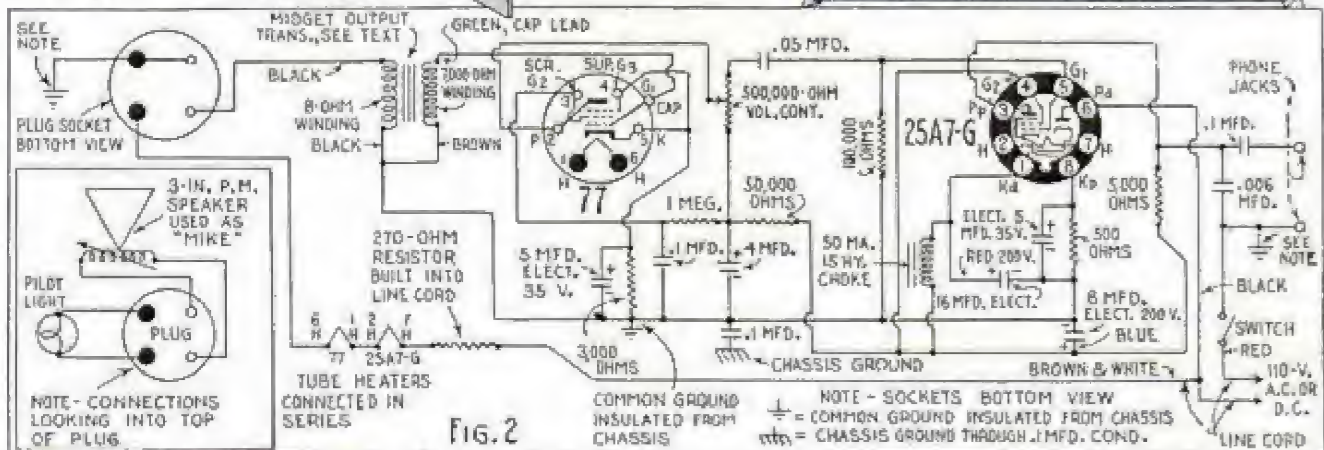
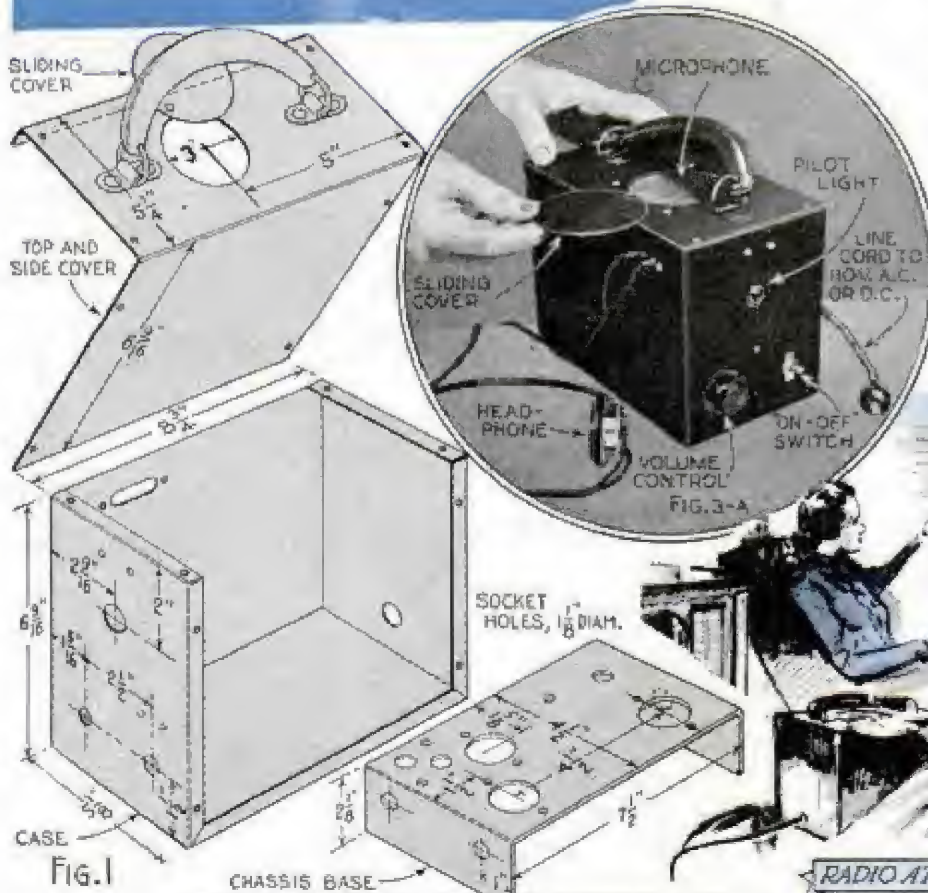
# PORTABLE HEARING

By M. N. Beitman



ANY radio experimenter can build this compact and efficient a.c.-d.c. hearing aid for about \$7.00. It combines high fidelity and sensitivity in a compact portable unit that will enable the hard-of-hearing to join in conversations, listen to the radio at normal volume level, and amplify ordinary telephone conversations. Also suitable for use as a detectaphone, or sensitive noise analyzer, it is easily portable and no

batteries are required. Entirely electrical in operation, the source of power may be 110 volts, d.c. or a.c. of 25, 50 or 60 cycles commonly used for ordinary house lighting in the United States and Canada.





# AID *operates* on A.C. or D.C.

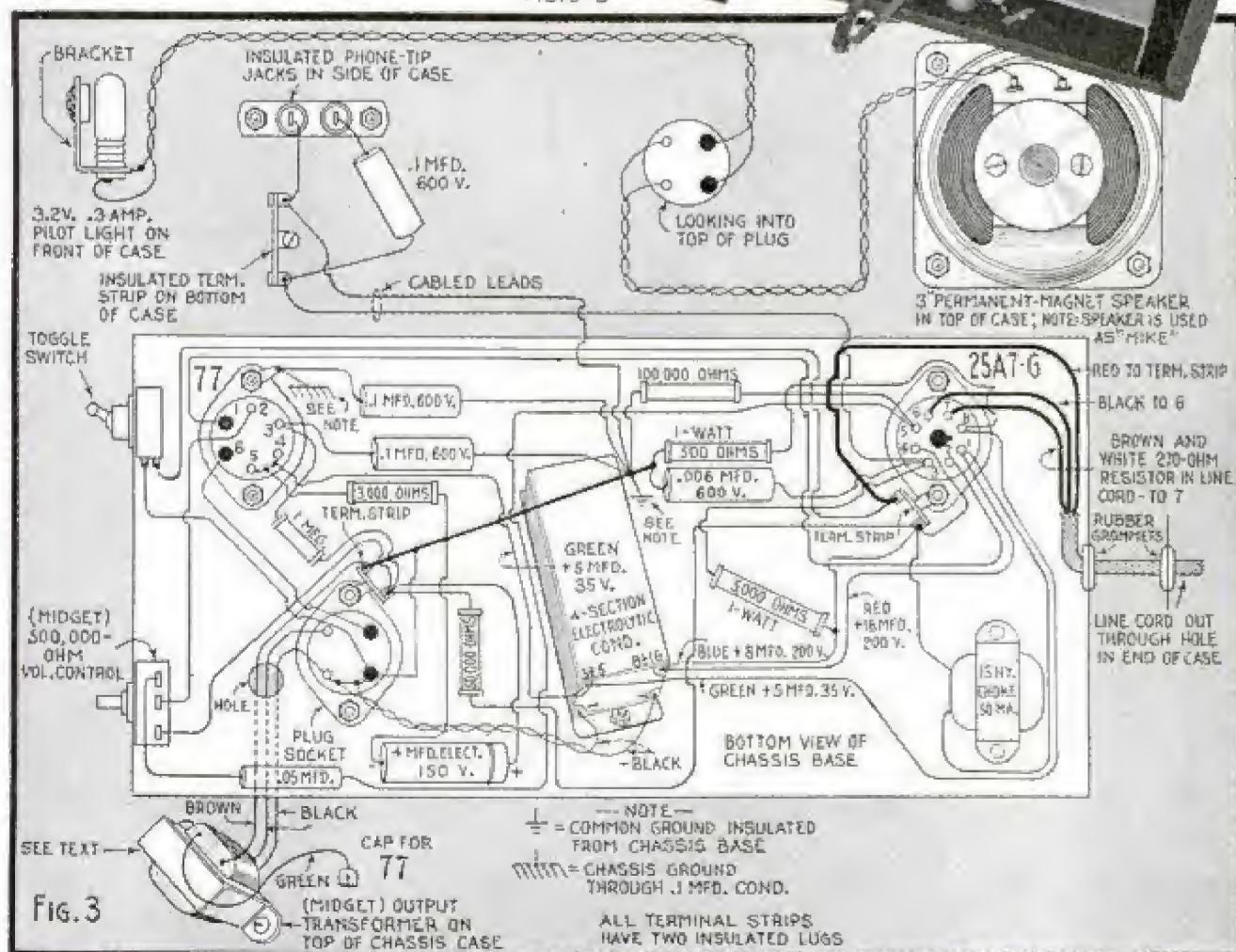
When plugged into the wall socket, and the switch is turned on, all sounds within a 12-foot radius of the unit will be amplified and reproduced in a single or double headphone, or bone-conduction unit if preferred.

The tubes are wired in series and the extra voltage is dropped in a standard line-cord resistor of 270 ohms; this circuit is a conventional, well-filtered type. A 3-in. permanent-magnet speaker serves as the microphone. Since this speaker has an 8-ohm voice coil, it must be coupled to the tube with a transformer. This midget output transformer has

(Continued to page 148A)

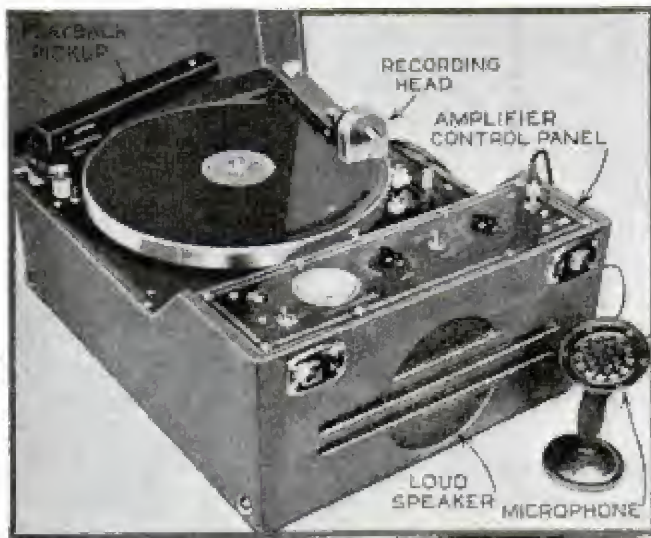


FIG. 3-B

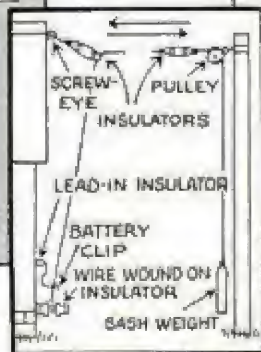
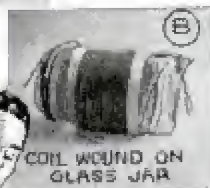
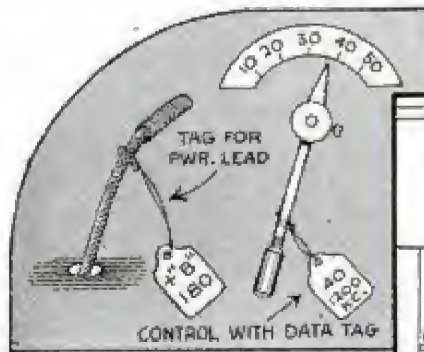




# Practical Hints for the Radio Experimenters

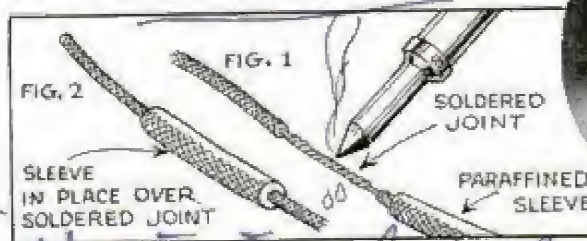


Below, small price tags provide an excellent means for marking leads when apparatus is removed for test or repairs; also handy for tagging controls with data for certain adjustments. A great time and patience saver on controls easily moved out of position

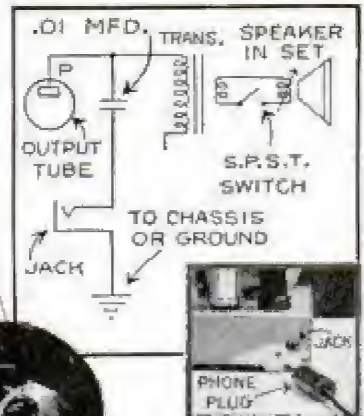


Above, adjustable experimental antenna to determine the best length for any particular receiver or locality. The antenna wire should slide freely through the end of the insulator on the building; a rope through pulley to a sash weight on the far end keeps antenna taut. Wire is wound around knob insulator until exact length is obtained as determined with battery clip. Clip is then removed and a soldered connection made at correct point

Left, A and B, low-loss transmitting coils easily wound on glass jar. Below, soldered joint protected with insulating sleeve. Right, compact neutralizing condenser for transmitter

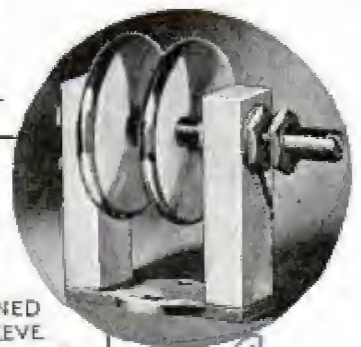


Right, headphone jack easily added to any set; plate connection necessary on one output tube only. Parts required: single-circuit jack; .01 mfd. 600-V. fixed condenser. Switch in voice-coil lead to silence speaker



Above, portable sound recorder and electric phonograph that may be connected across the speaker voice coil in your radio receiver to record domestic and foreign programs off the air. Anyone can make records of favorite music, famous speakers and outstanding news events with this home recorder which reproduces the records as soon as they are made

Above,  $\frac{1}{8}$ -in. sheet aluminum and  $\frac{1}{16}$  by  $\frac{1}{2}$ -in. brass angle stock may be used for shield boxes of any required size



Hammarlund Mfg Co  
424 1133 1000



# SPEAKER CABINET

## *Extends Tone Range*

By Paul H. Nelson

HERE is a speaker cabinet that you can build for less than ten dollars, which will enable you to use any good medium-sized magnetic or dynamic speaker and bring in the low notes with a quality not present in an ordinary speaker, and about an octave lower than with the usual type of cabinet. These low notes have a rich, velvety quality, and the high notes lose none of their brilliancy.

The high-fidelity performance is due to a long torturous path coupled to the back of the speaker cone as indicated in

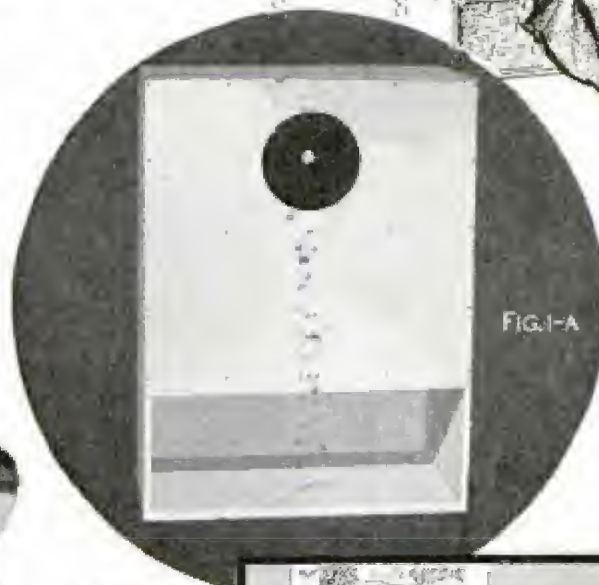
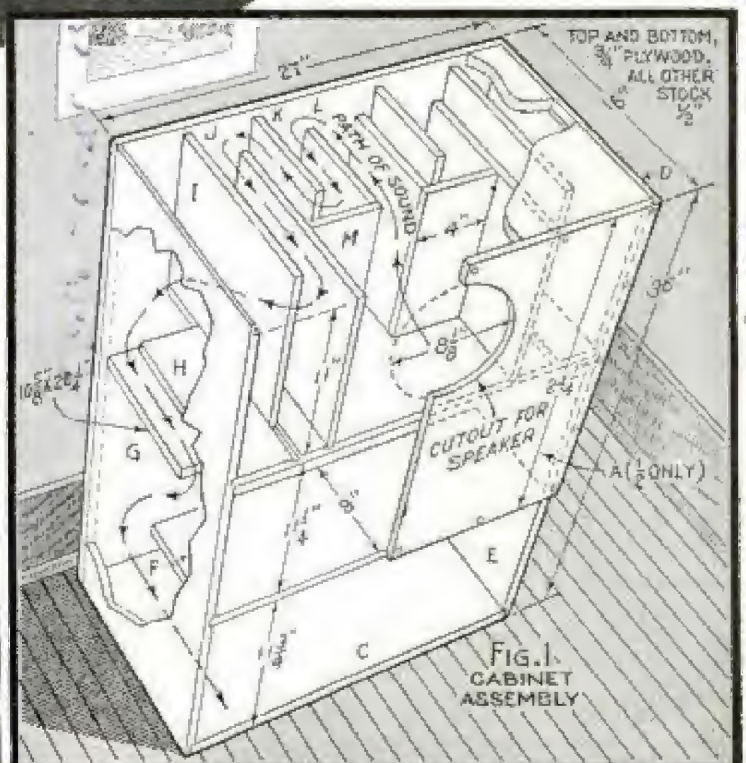


Fig. 1; this long sound-path between the front and back of the speaker increases the radiation resistance in the same manner as a large baffle.

(Continued to page 138A)



FIG. 1-B





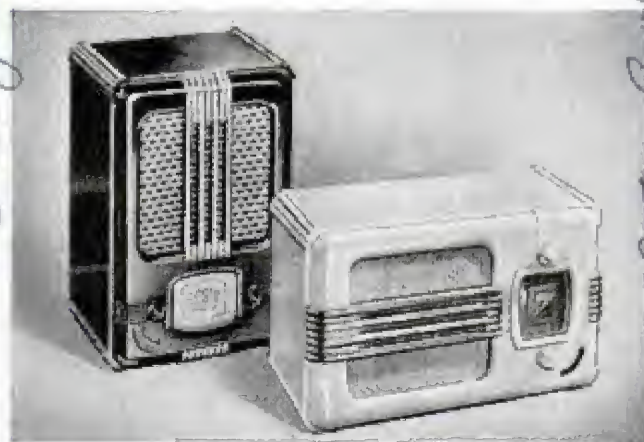
## Cathode-Ray Tube for Television



Rated at 6,000 volts, this large television tube has a screen 12 in. in diameter and is designed to prevent de-focusing of the spot when the video signal modulates the tube. It is claimed that a sharp focus is maintained at all signal values thus giving a clear-cut television picture.

## Set Operates in Two Positions

This 5-tube a.c. superheterodyne receiver is housed in a plastic cabinet and can be placed either in the upright or lay-down



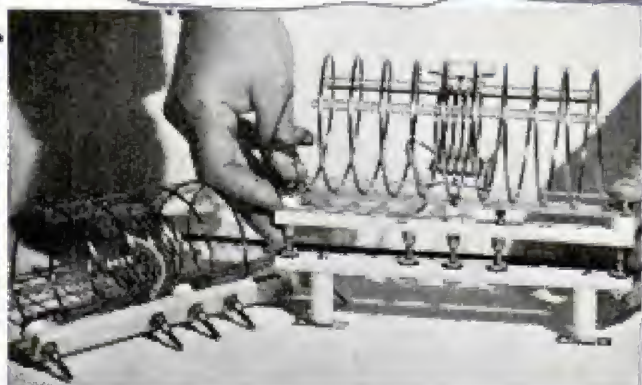
position, the dial being perfectly legible in either case. The high-gain circuit includes automatic volume control and type-41 pentode output tube.

## Table Model Radio-Phonograph

Housed in a cabinet measuring  $16\frac{1}{2}$  by  $11\frac{1}{2}$  by  $13\frac{1}{2}$  in., this compact a.c.-d.c. combination radio and phonograph employs a dynamic speaker with extra large field coil and transformer for tone quality. Radio covers broadcast and short-wave 16-50 meter bands; phone pickup is of the crystal type.



## Plug-In Inductors with Link Coils



Low-loss transmitting inductors for all-band operation are available with internally mounted, fixed or variable, link coupling coils. They are mounted on "Steatite" bars equipped with plugs to complete connections when inserted in the standard jack base shown in the photo.

Blueprints covering radio construction articles in past issues are available for 25 cents each; original material lists and additional information can be obtained from our Radio Department without charge upon receipt of postage.

**NEXT MONTH—How to Build a Three-Tube Radio Direction Finder.** An inexpensive battery-operated loop set which works on the same principle used in aircraft and marine direction finders; can also be employed to receive broadcast programs for entertainment. The simple circuit uses type-6J7 and 6F5 high-gain tubes.

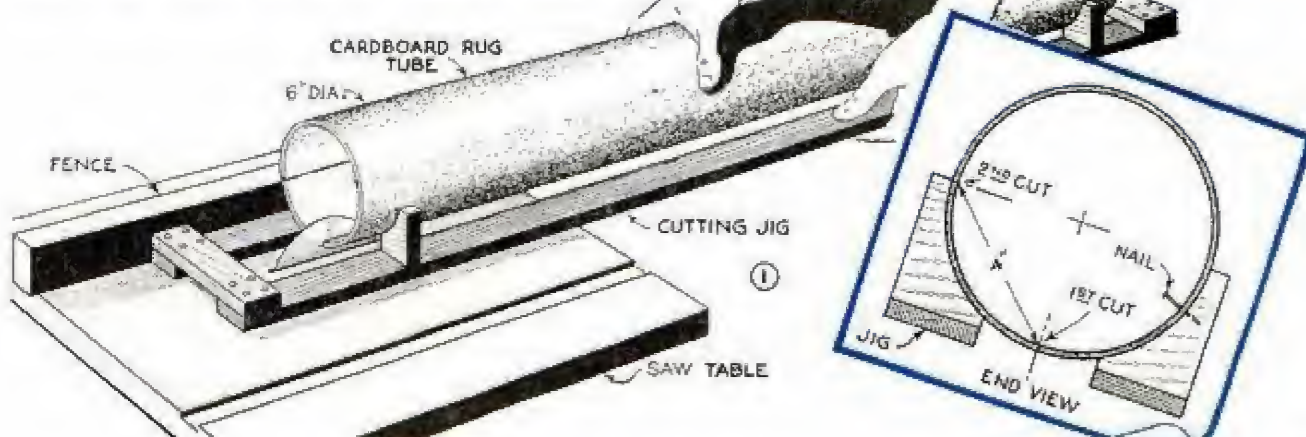




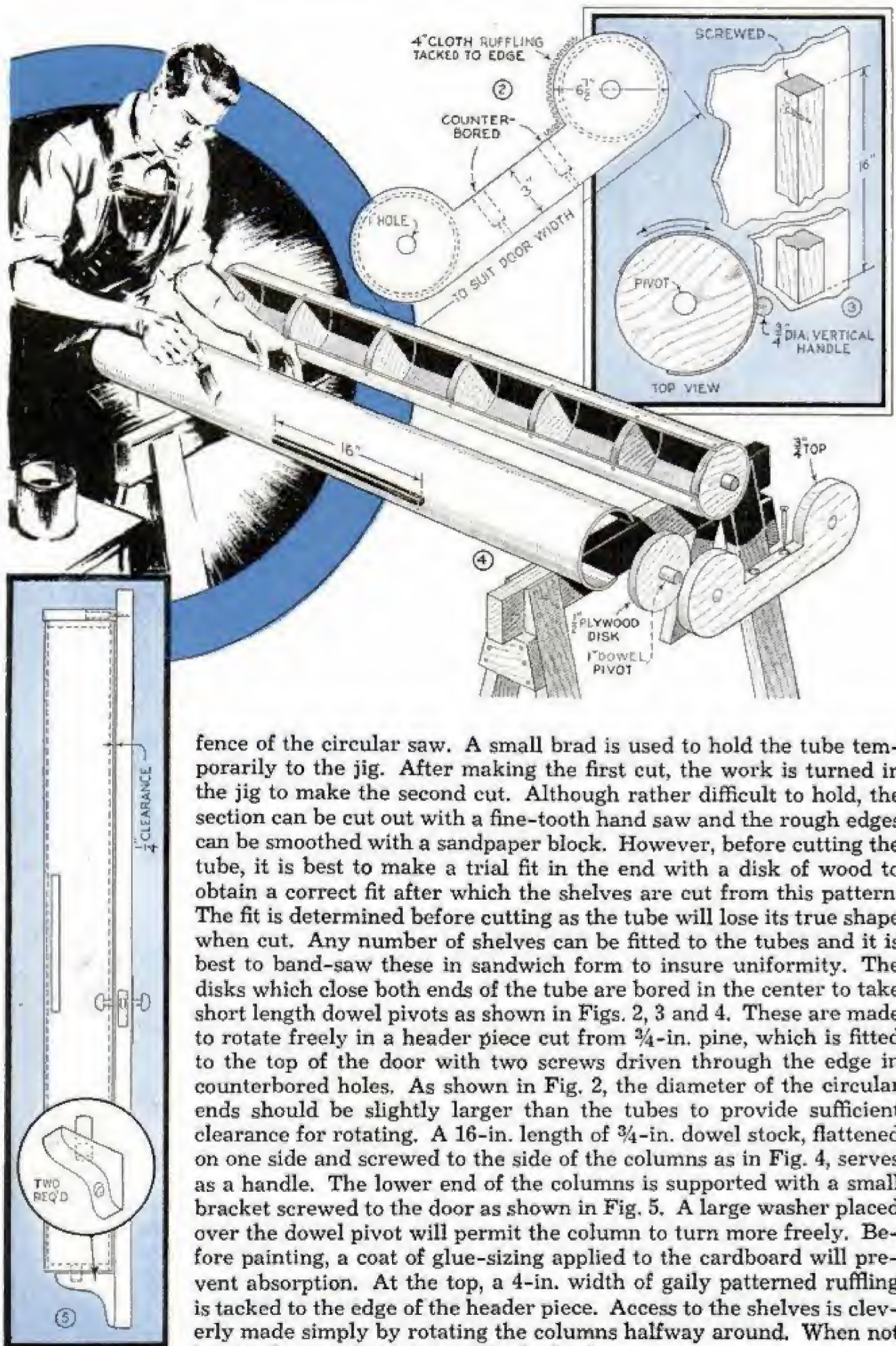
# "On-a-Door" VANITY CABINET

BESIDES contributing to the conservation of space in the small apartment, converting a mirror door into a convenient vanity by fitting twin-shelf space at each side and wiring for an overhead lamp, will also furnish milady with an extra "powder room" with ample space for numerous jars of cream, lotions, etc.

The columns are made from stiff cardboard rug tubes which can be obtained from a local furniture dealer. No over-all dimensions are given because the door on which the case is to be hung determines the proper size and measurements. Allowance should be made so as not to interfere with the opening and closing of the door. Fig. 1 shows a simple method for holding the tube in alinement while cutting the opening in it. A cradle-shaped jig similarly made from scrap stock, as shown, holds the tube firmly as it is guided along the



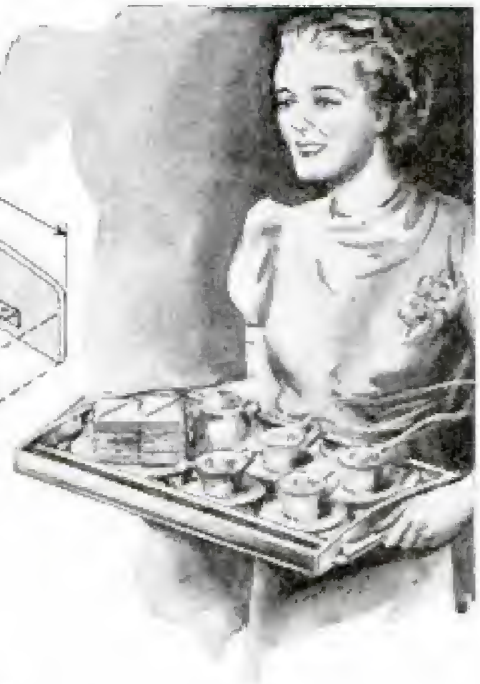
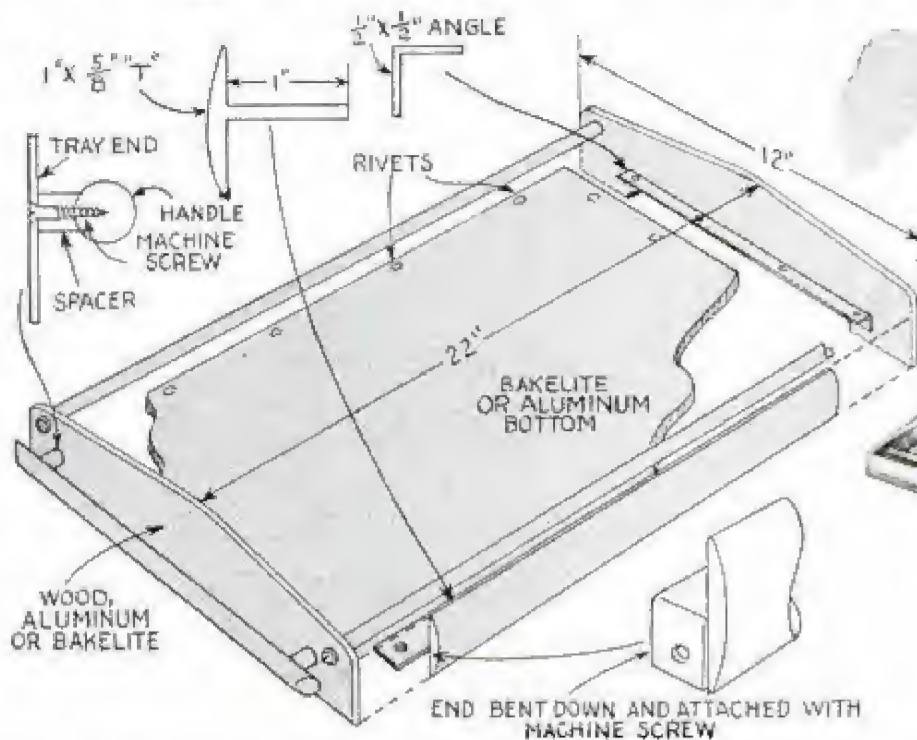




fence of the circular saw. A small brad is used to hold the tube temporarily to the jig. After making the first cut, the work is turned in the jig to make the second cut. Although rather difficult to hold, the section can be cut out with a fine-tooth hand saw and the rough edges can be smoothed with a sandpaper block. However, before cutting the tube, it is best to make a trial fit in the end with a disk of wood to obtain a correct fit after which the shelves are cut from this pattern. The fit is determined before cutting as the tube will lose its true shape when cut. Any number of shelves can be fitted to the tubes and it is best to band-saw these in sandwich form to insure uniformity. The disks which close both ends of the tube are bored in the center to take short length dowel pivots as shown in Figs. 2, 3 and 4. These are made to rotate freely in a header piece cut from  $\frac{3}{4}$ -in. pine, which is fitted to the top of the door with two screws driven through the edge in counterbored holes. As shown in Fig. 2, the diameter of the circular ends should be slightly larger than the tubes to provide sufficient clearance for rotating. A 16-in. length of  $\frac{3}{4}$ -in. dowel stock, flattened on one side and screwed to the side of the columns as in Fig. 4, serves as a handle. The lower end of the columns is supported with a small bracket screwed to the door as shown in Fig. 5. A large washer placed over the dowel pivot will permit the column to turn more freely. Before painting, a coat of glue-sizing applied to the cardboard will prevent absorption. At the top, a 4-in. width of gaily patterned ruffling is tacked to the edge of the header piece. Access to the shelves is cleverly made simply by rotating the columns halfway around. When not in use, the opening is turned to the back.



# Serving Tray Made from Colorful Materials



Just imagine this tray with a black Bakelite bottom, aluminum end pieces and side rails, set off with red plastic handles. Or, the same tray can be made up in other attractive combinations. It may be heat or acid proof, as you desire, and the cost depends on the materials used. The sides are strips of T-shaped aluminum molding. The bottom, ends and handles can be any material desired, and the rods, which serve as side rails, may be wood, metal or plastic. The bottom is riveted to the T-shaped

strips and to angles bolted, screwed or riveted to the ends. Note how the sides are attached to the ends. Part of the rounded portion of the T-strip is cut away at the end, after which the remaining piece is drilled and then bent down to take a bolt or screw in the end of the tray. Handles are attached with screws driven through from the inside of the tray. Spacers between the handles and the ends of the tray afford easy gripping with the hand.

—H. H. Ragatz, Denver, Colo.

## Garden Seeds Are Stored in a Handy Matchbox Cabinet

Empty, safety-match boxes glued together provide a neat little cabinet for storing garden seeds. Appearance of the cabinet is improved and rigidity is added by wrapping the sides, back and top with oilcloth, wallpaper or fancy wrapping paper, which is glued or pasted in place. If a paper covering is used, it's a good idea to apply a coat of white shellac. Two-pronged paper fasteners pushed through the fronts of the boxes serve as drawer pulls.—Bess Livings, Batavia, Ill.

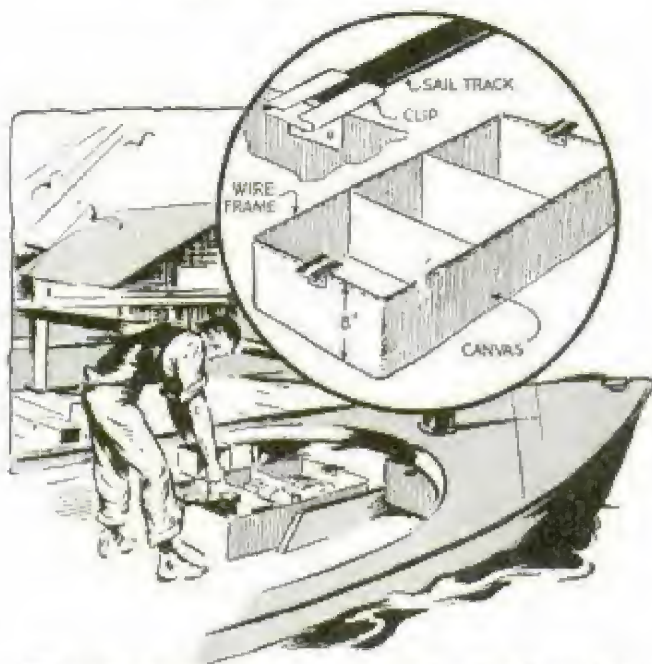
☐ When packing eggs in a case, put the longest ones in the corners and set them in a slanting position so that they will not project above the filler and be crushed.



*Small seeds are quickly stored and labeled in this small cabinet, which keeps them safe until spring*



## Sliding Basket under Boat Deck Serves as Locker



*This basket provides a dry place for food, clothes, camera and other articles on a sailboat*

On sailboats and runabouts that have large forward decks and no lockers, this basket solves the problem of storage for food, cameras, clothing, etc. It consists of a canvas basket stitched around a heavy wire frame, which is fitted at the ends with clips to slide on a piece of sail track. This is screwed to the underside of the deck. If desired, the basket can be partitioned, and it can be provided with a lock by slipping the shackle of a padlock around the track between the deck and frames.

—Edson E. Foster, Evanston, Ill.

## Floating Lids for Photo Solutions Cast from Paraffin



Floating covers to protect solutions in photo, plating or processing tanks, are easily made from paraffin, which is acidproof and non-absorbent. The covers are cast in a flat container, such as a cake pan, by

pouring the melted paraffin into it to a depth of  $\frac{1}{2}$  in. When cool, the hardened castings are removed by warming the con-

tainer, and handles, shaped from small square pieces of the wax, are attached by softening the contacting surfaces with heat.

## Strainer Cloth on Paint Bucket Held with Twisted String

Instead of tying the string that holds the cloth when straining paint, I twist the ends together and pull it tight as indicated. Held in this way, the string will not loosen of its own accord, yet



—Ted L. Robbins, Los Angeles, Calif.

## Rungs on This Homemade Ladder Set at Angle to Ease Foot

Set the rungs of a homemade ladder at a slight angle, as indicated in the detail, instead of nailing them flatly to the sides, so that the worker can stand on the narrow flat side instead of on the edge. The notches for the rungs are formed in the sides of the

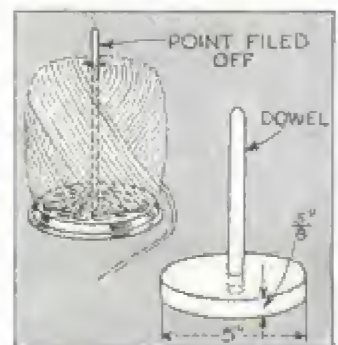


ladder by making two saw cuts. Another way to accomplish the same purpose is to bevel the top side of each rung with a plane and then nail it on the ladder sides in the usual manner.

—R. L. Allen, Dothan, Ala.

## Yarn on Bill-File Spike

A bill-file spike of the type that has an iron base serves nicely as a holder for a ball of knitting yarn. The spike is heavy enough to stand firmly, and the yarn ball is kept



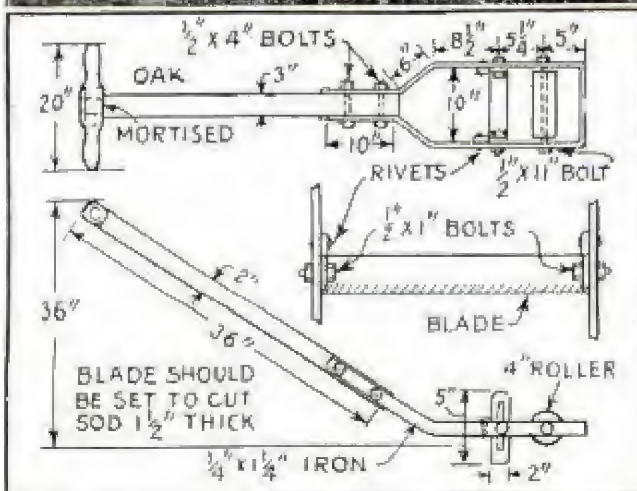
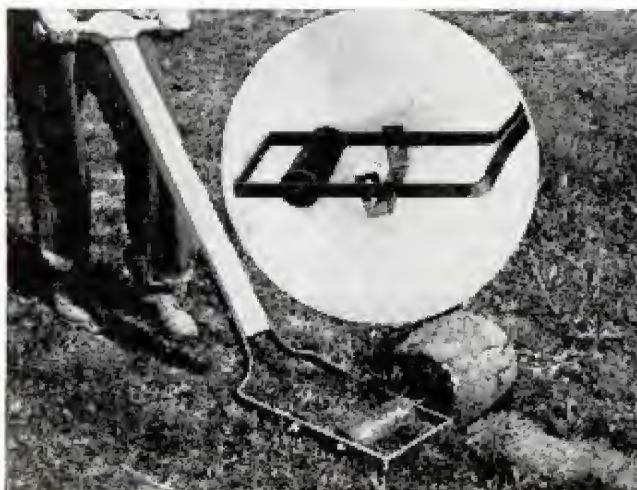


clean and untangled. The pointed end of the spike should be filed off to avoid injury to the hands. A similar holder can be made by inserting a dowel in a wood base. If the holder upsets easily, make a recess in the underside of the base, drive a couple of wood screws part way into it and then fill it with molten lead. The screws anchor the latter in place. A piece of felt glued to the base will protect varnished surfaces.

—Bess Livings, Batavia, Ill.

### Cutter Peels Sod Rapidly

With sod finding more and more use in stopping gullies and in other forms of erosion control, this sod cutter will save labor and time for the home owner and farmer. It consists of a  $\frac{3}{8}$  by  $1\frac{1}{4}$ -in. flat-iron frame, a cutter adjustable for depth and a roller



*Several hundred square feet of sod can be stripped off in a short time with this cutter*

to hold the cutter at the depth to which it is set. The assembly is fitted with a strong handle, and is pushed along the ground to strip off the sod.

—Wyman S. Smith, Des Moines, Ia.

### Artist Matches Paints on Glass with Tints of Landscape

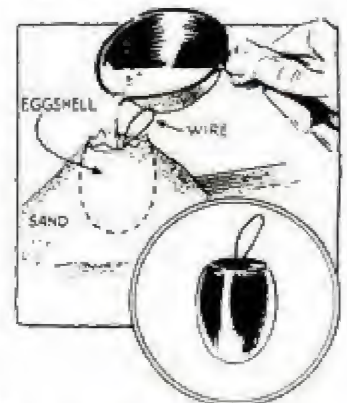


*Artist compares paint with color of landscape by observing both paint and scene through this test glass*

To match tints when painting a landscape, one artist uses a piece of glass on which he applies the paint. By looking at the landscape through the glass adjacent to the painted portion, he is able to compare the colors closely. If desired, the glass can be fastened on a wood handle, a slot in the end of the handle fitting the glass snugly.

### Fisherman's Lead Sinkers Cast in an Eggshell

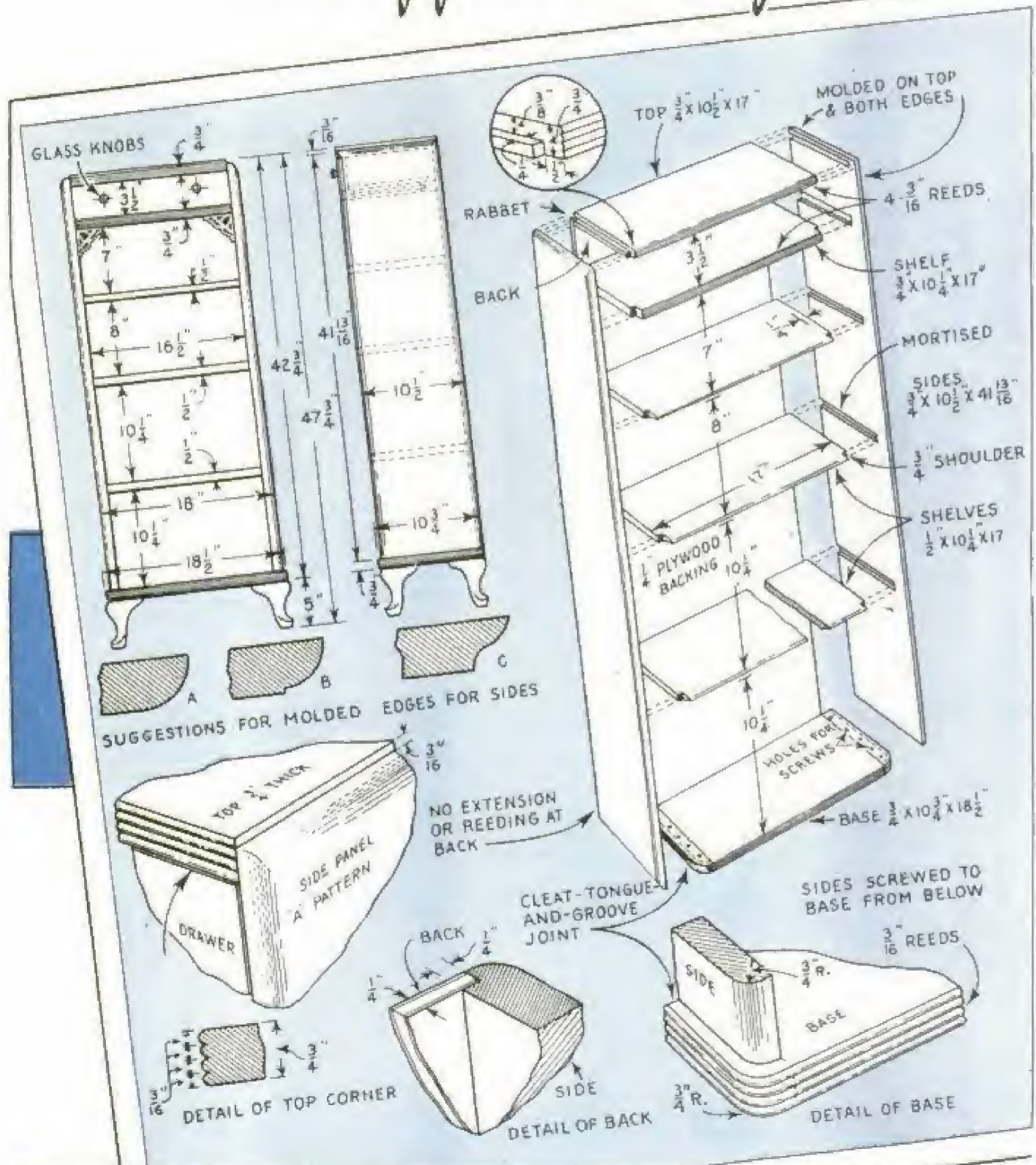
When spending a few days at a lake, one fisherman needed some heavy sinkers, and having no mold at hand in which to cast them, used an eggshell. The end was broken from an egg, the contents removed and the shell set in sand as indicated. An anchoring wire was placed in the shell and molten lead poured into it.



—G. E. Hendrickson, Argyle, Wis.



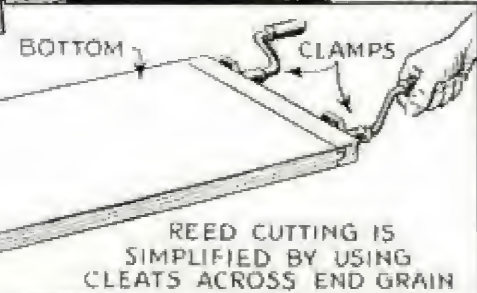
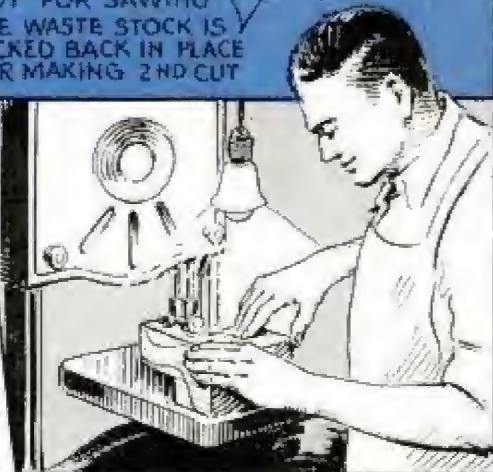
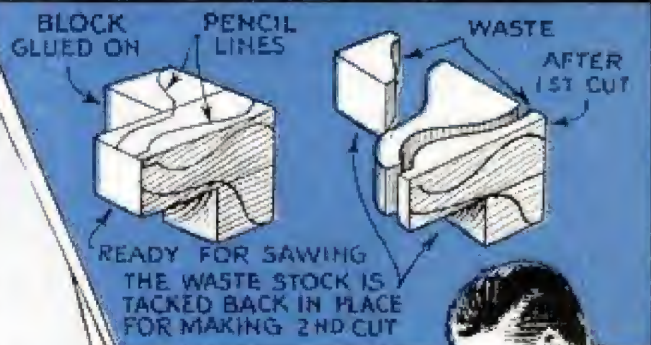
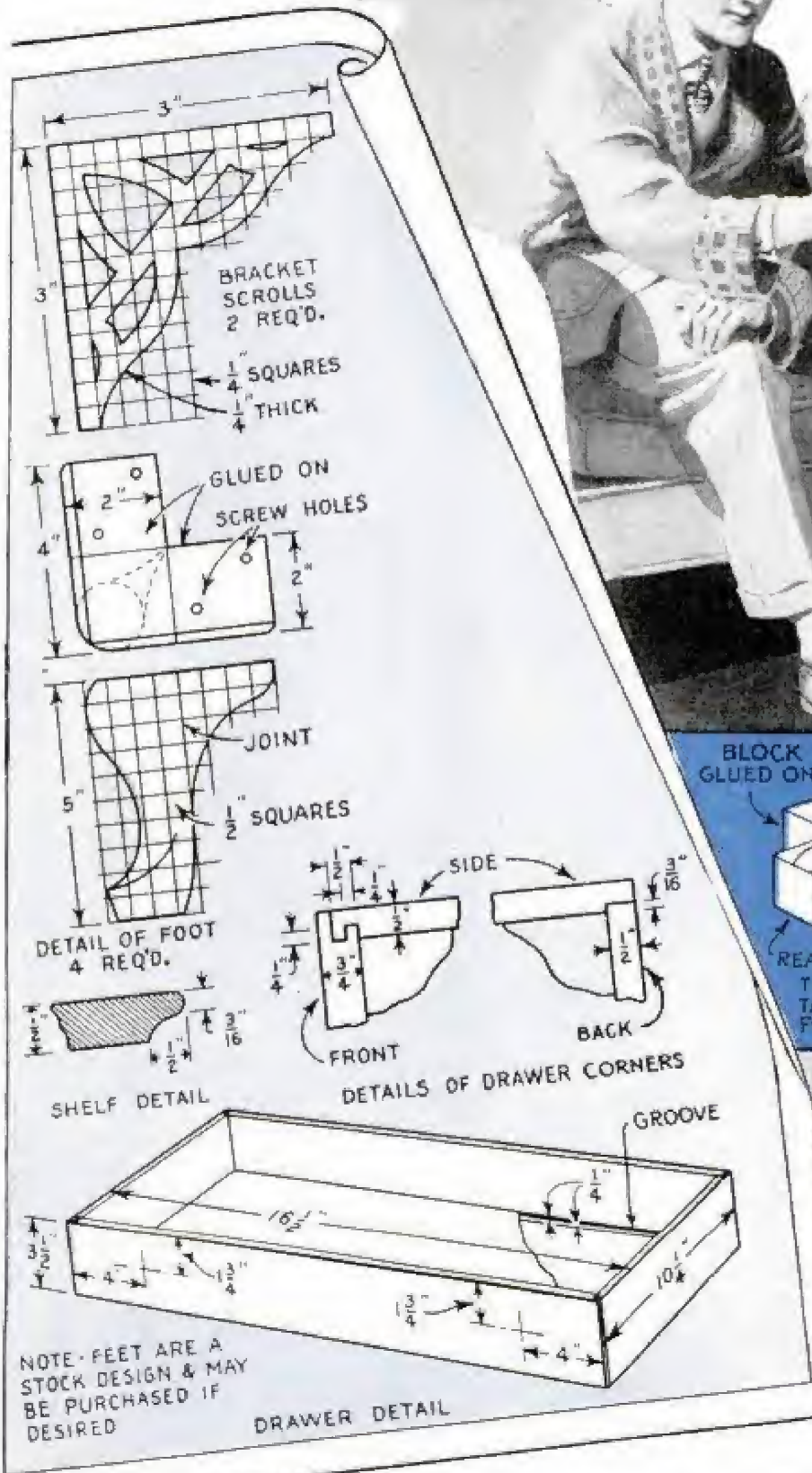
# Living-Room BOOK- in Chippendale style



Modeled after an original from the shop of a famous designer, this bookcase will supply a distinctive decorative touch for your den or living room. Sides and shelves should be of solid mahogany with a backing of birch plywood. Use mahogany plywood for the drawer front, with the grain running the short way



# CASES





## Mailbox on Porch Is Viewed with Aid of Mirror

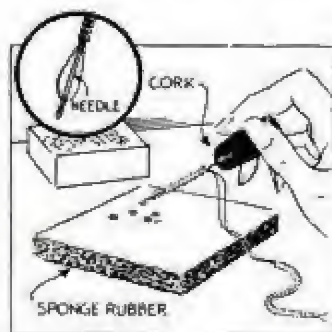


*Mirror on porch post enables you to see mailbox by looking through a window or door*

In order to see the mailbox without going outside, one home owner mounted a mirror on one of the porch posts so that the image of the box was reflected to a window. If moisture condenses on the window glass during cold weather so that it is difficult to see the mirror, a small celluloid defroster, of the type used on cars, can be taped to the glass on the inside.

## Bead Stringing Simplified

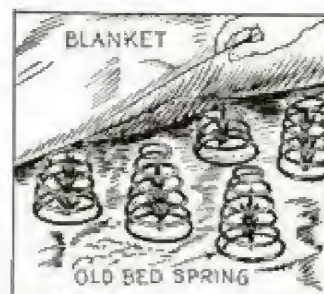
Instead of inserting the pointed end of a needle in the holes of beads when stringing them, insert the eye end. The thread loop near the eye tends to expand after the beads pass over it and helps prevent them from slipping off. A cork is slipped over the sharp point to avoid pricking the hand, and is removed, after a number of beads have been picked up, to slide them onto the string or



thread. A further convenience in bead stringing is to place the beads on a piece of sponge rubber instead of in a dish so that they are less likely to slip around.

## Young Plants Protected by Coils from Old Bed Spring

A gardener who wanted to transplant some flower and vegetable plants before danger of frost was past, solved the problem of covering the plants on cold nights by setting a coil from an old bed spring over each one. The coils supported a blanket laid over the seedlings.



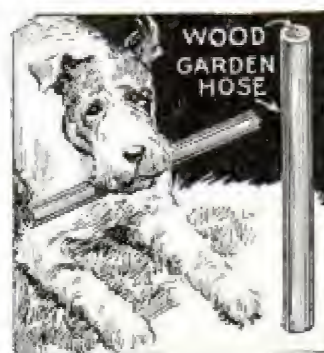
## Handling Litmus Test Paper to Avoid Finger Marks



When removing litmus paper packed in vials for test purposes, take it out with a pin or needle stuck into the lower end of the cork of the vial as indicated. If the paper is removed with the hand, acid from perspiration on the fingers is likely to damage paper remaining in the vial.

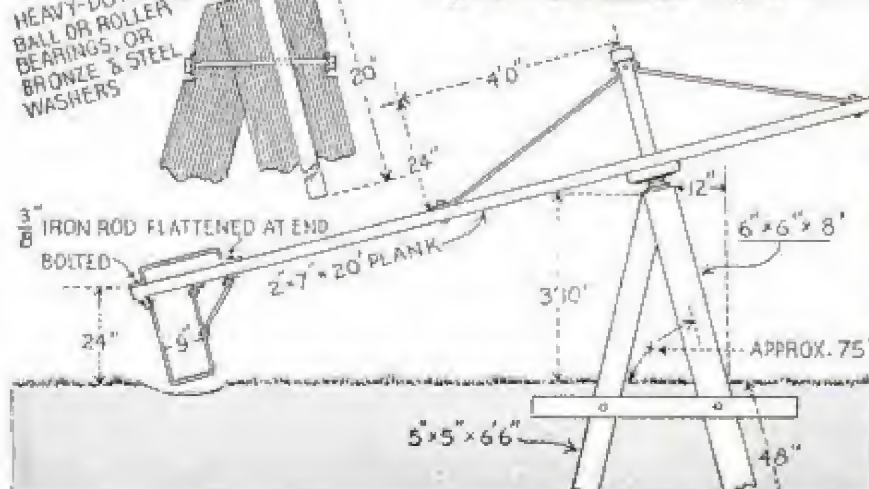
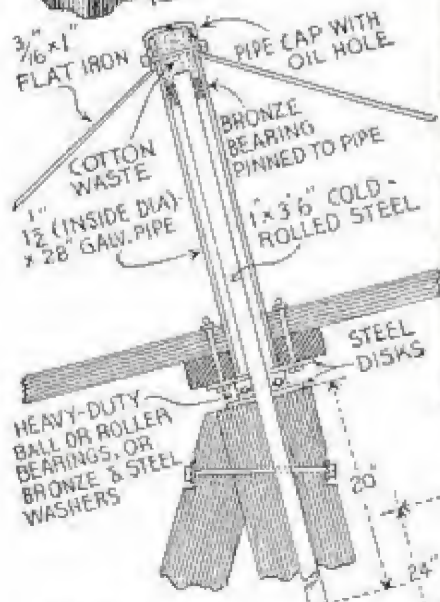
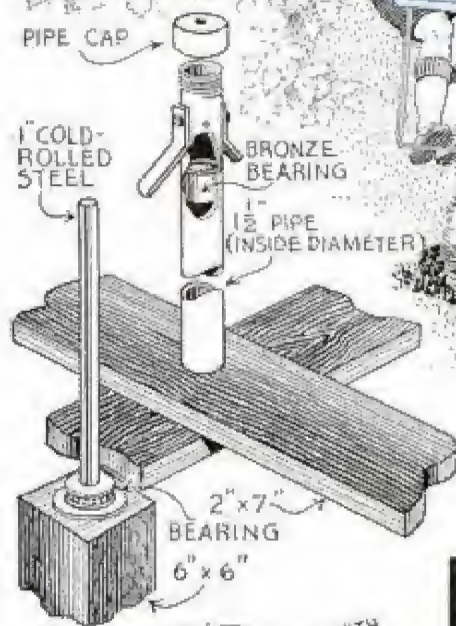
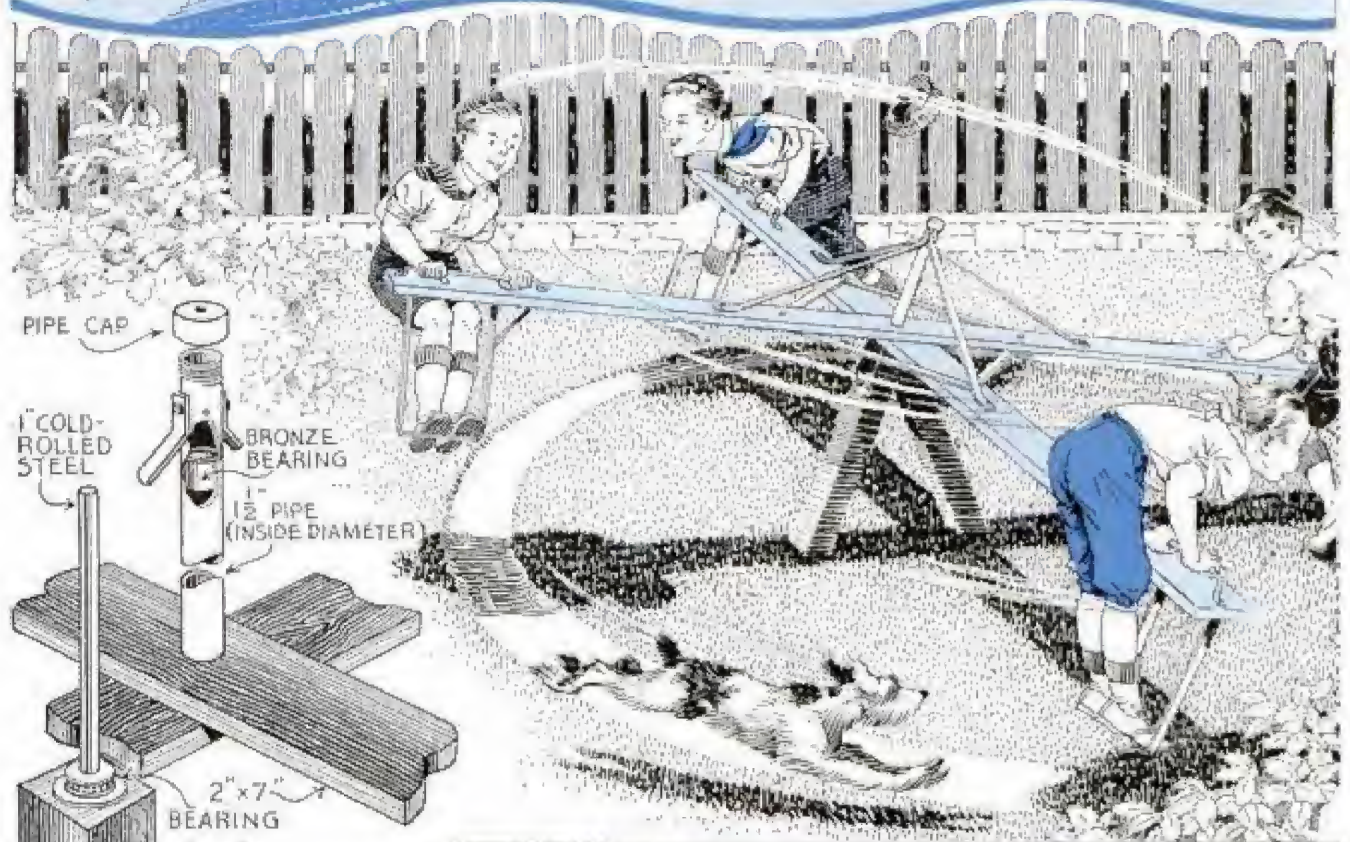
## Dog's Play Stick Rubber-Sheathed

If your dog likes to play with sticks he picks up around the home, why take a chance of having him get a splinter in his mouth or throat? Give him a rubber-sheathed stick, which you can make by cutting down a piece of broomstick to the desired length to fit and slipping it inside a piece of garden hose.

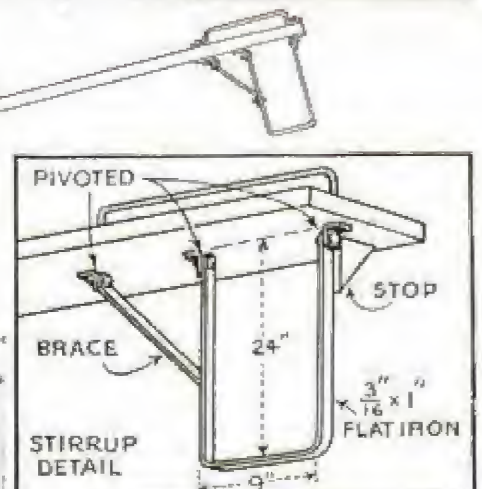




# "Ocean Roll" MERRY-GO-ROUND

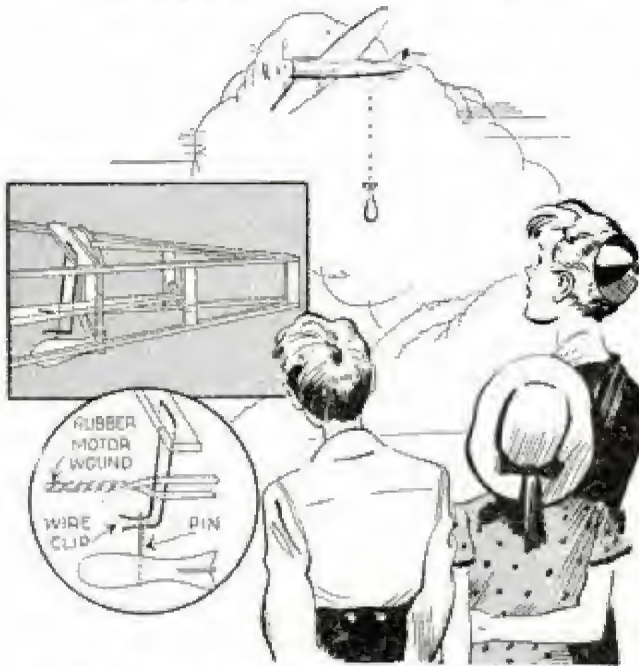


Whirling around on this merry-go-round gives you a sensation somewhat like that on a boat in a heavy roll. The axis is set at an angle to give an up-and-down movement while rotating. There's a handgrip and a stirrup on each crosspiece, the stirrup being pivoted so that it will swing back and not injure anyone who might accidentally fall in its path at the low point. A block in front of each stirrup keeps it from swinging forward too far. Weight of riders traveling from the high to the low point helps to keep the thing moving and each one has to push only about one quarter of a turn before he hops on.





## Bomb Rack for Toy Airplane Drops Objects in Flight



*This bomb is released when the rubber-band motor of the plane is nearly unwound*

You can have a lot of fun "bombing" if you fit your model airplane with a bomb rack of the type shown. The rack, which is intended for airplanes operated by rubber-wound motors, is a piece of wire bent to a U-shape, run through a cross member of the fuselage and then bent at right angles near the ends. The wire is inserted between the rubber strands of the motor so that when the latter is wound, the strands twist and press the ends of the wire together to grip a pin pushed into the bomb or other object you want to drop. As the motor unwinds in flight, the wire ends spread and release the bomb, which then falls in a realistic manner.

—Roger Bennetts, Ishpeming, Mich.

## A Non-Reflecting Paint

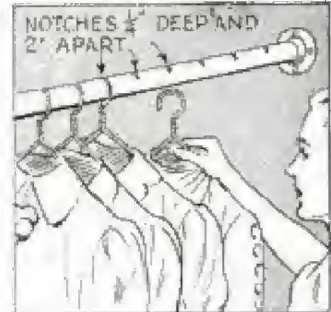


Suitable for covering the inside surfaces of cameras, telescopes, binoculars and other optical instruments, a paint that will not reflect light is made by mixing lamp-black with shellac, varnish or lacquer

which has been thinned with a solvent. The paint must be stirred frequently while using, to prevent settling of the pigment.

## Closet Clothes Pole Is Notched to Keep Hangers Apart

Creasing of garments by having them pressed together on a crowded clothes pole in a closet, is avoided by cutting notches or grooves 2 in. apart, in the top surface of the pole, to take the hanger hooks. For accommodating overcoats and other extra bulky garments, the spacing of the notches should be increased.—B. Livings, Batavia, Ill.



## Ladder Tied on Wheelbarrow to Move It About

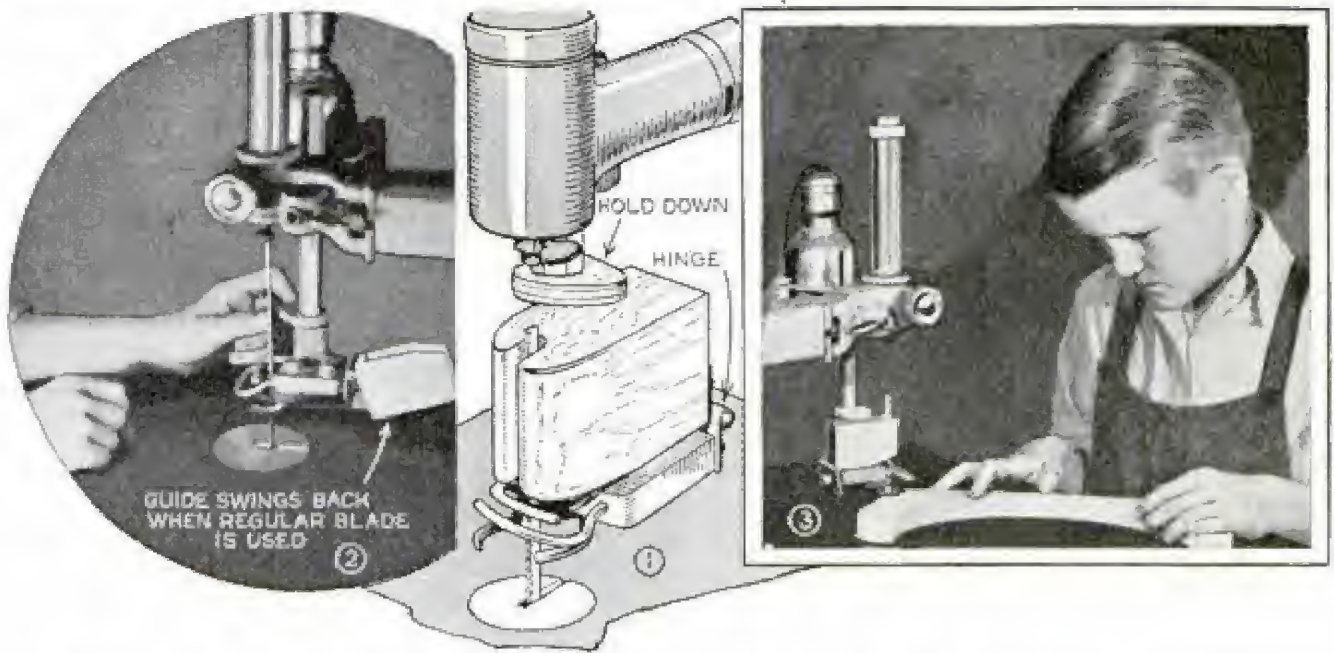
Disliking the task of carrying a heavy ladder from place to place on his shoulder, a painter provided a pair of leather straps on the sides as indicated so that it could be attached to a wheelbarrow. The straps are looped to fit snugly over the handles of the wheelbarrow.



*Attached to the handles of a wheelbarrow by means of straps, a heavy ladder is transported easily*



## Guard on Jig-Saw Blade Protects the Fingers



Exposed saber blades used in a jig saw are completely covered by the guard shown in Figs. 1, 2 and 3, which assures protection for the fingers so that even a small boy can operate it safely. The guide is shaped as shown, from a hardwood block

and is hinged to the rear of the pressure-foot assembly. A plywood holddown or cam on the shaft of the pressure foot is swung around to keep the guard from tipping back if the hand should strike it.

—Edwin M. Love, Monterey Park, Calif.

## Photographs Printed Through Cloth Have 'Fabric' Finish

You can give your photos a distinctive fabric-like finish, that makes them stand out from the usual run of pictures, with equipment no more elaborate than a piece of cloth. In selecting negatives, use only those that have good contrast and those in which the details are large enough not to be blurred by the mesh finish. Any kind of thin cloth will do, and various effects can be had by selecting fabrics of different weaves. To print the photos, place the cloth between the glass of the printing frame and the negative. Then print the photos in the regular way. Longer exposures will be necessary because of the cloth.—Paul Hadley, Piggott, Ark.

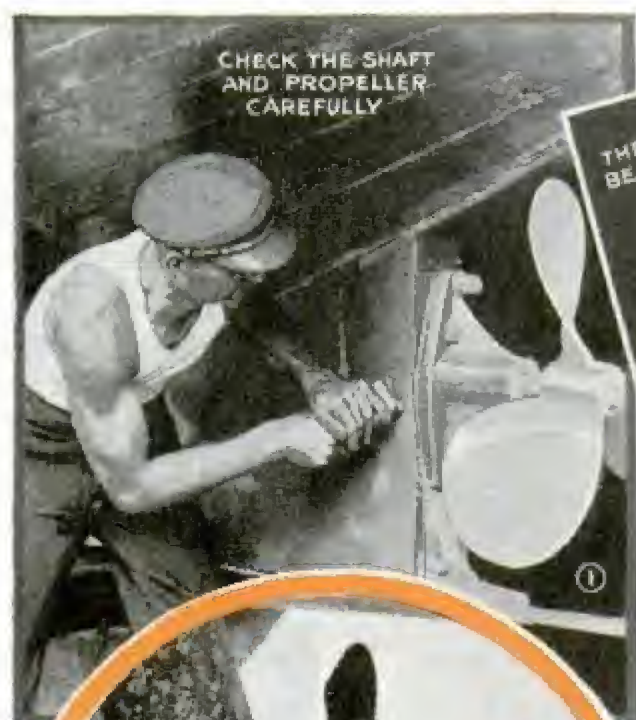


## Salvaging Scraps of Soap

Save your small pieces of soap and boil them in water, 5 parts, to soap, 1 part. The resulting solution can be stored in a bottle that has a small hole in the cap to convert it into a dispenser. It's best to select a bottle with a screw cap, which can be removed for refilling.



# BEFORE LAUNCHING



By Walter E. Stewart

## PART I

**T**HE first thing to do is to throw back the winter cover, open up the cabin, icebox, lockers, and every other inclosed space to let in fresh air. If the motor ran smoothly at the end of the season, it is not likely to need any detailed overhaul. On the other hand, if it did not operate satisfactorily, now is the time to locate the trouble and apply a permanent remedy. Loose hold-down bolts or lag screws, Fig. 4, which permit the whole motor to vibrate often cause a noise easily mistaken

for a main-bearing knock. Quite often a metallic click, thought to be due to loose connecting-rod bearings, is in reality due to too much tappet clearance. You can check this without disassembling the motor. On most motors you can check main bearings by slipping a bar under the flywheel as in Fig. 5. If you suspect worn piston rings or leaky valves, drain the old oil, refill with new, run the motor until warm and then test compression by turning the flywheel. Each cylinder can be tested individually by leaving the spark plugs out of all the others. Any one of these defects should be eliminated by adjustment or the installation of new parts. Periodic checks of the ignition system are always advisable. If there is a handhole opening into the water jacket of the motor, take it off and clean out all the rust and crystallized salt. Be sure to use a new gasket when you replace the cover. Do not fail to repack piston-type water pumps, either on the motor or in connection with other fixtures, Fig. 7. With the motor running properly the next thing is a thorough job of cleaning the block. Use kerosene to wash off all the old grease, a wire brush to get off the rust, and plenty of rags to clean up. Never use gasoline to clean a motor which is still in the boat as the fumes will inevitably drift to the bilge and stay there to form a constant menace. Finally give the block a coat of engine



# YOUR BOAT—

*Many helpful pointers on fitting out your boat whether it's a motor-driven launch or a small rowboat*



enamel, and the exhaust manifold, line, and muffler a coat of aluminum enamel.

If the propeller, Figs. 1 and 2, is dented or nicked it will pay to have it trued up by a professional. However, if you must do the work yourself, fill in scratches and small dents with solder, and carefully hammer any bent edges back into their original shape. Nicks in the edges of the blades had best be filled in by brazing with new bronze. Bent propeller shafts waste power, cause serious vibration, and make it impossible to keep stuffing boxes from leaking. To check up, disconnect the shaft from the motor and turn the propeller over by hand. It should not bind at any point in a complete revolution. Such binding is sure evidence of a bent shaft. Sometimes loose bearings prevent slight bends from showing up by this test, but you still can detect a bend by supporting a pencil point just clear of the shaft while a helper rotates it. If the pencil touches at one part of the revolution and does not at another, the shaft is bent and must be straightened. Propeller-shaft stuffing boxes always should be repacked. Twisted calking cotton, saturated with waterproof grease, is as good as anything you can get. If your boat is an auxiliary hav-



THE ENGINE WILL NEED A THOROUGH OVERHAUL

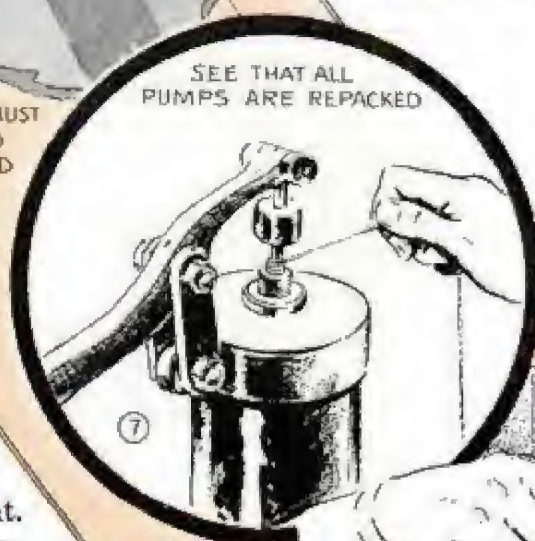
ing a feathering propeller be sure to flush out all the old grease and water with thin lubricating oil, then refill completely with waterproof grease. Do not reconnect the propeller shaft to the motor until the boat is in the water.

Now, the bilge. First, remove the metal ballast, clean it thoroughly and paint first with red lead, then with a good preservative paint. Clean out all the recesses of the bilge, and if necessary, scrub it with a strong solution of tri-sodium phosphate. Check up on frames and planking while doing this. When the bilge is thoroughly dry apply one or two coats of a good creos-





⑥  
THE BILGE MUST  
BE CLEANED  
AND PAINTED



SEE THAT ALL  
PUMPS ARE REPAKED



SANDPAPER  
BEFORE  
VARNISHING



SPAR VARNISH  
FOR THE  
CABIN AND  
TRIM



RIGGING  
SHOULD BE  
CHECKED

sote-base paint, Fig. 6. If you have a dinghy, Fig. 2, it will probably need the same paint treatment. Figs. 8 and 9 show two essential steps in connection with the interior varnishing. Surfaces always should be sandpapered smooth. When varnishing panels as in Fig. 9, coat all moldings, edges and corners first so that you can work away from them and prevent sagging of the varnish film. Peeled or blistered paint and varnish never can be covered up. The only remedy is to remove it completely and start again from the bare wood.

There is likely to be some water, collected by condensation, in the gasoline tank. Few tanks have outlets at the very lowest point, and the water tends to collect in the low spot until its level is up to the outlet. If there is a handhole in the tank you can dry out the interior with a cloth. Otherwise, use a suction pump and a length of rubber tubing to draw out the water. A part of the cleaning job is to blow out the tubing which connects gas tank to the carburetor. An automobile tire pump is excellent for this. After cleaning, put a little of each liquid in the gas and water tanks, and search for leaks. The most fre-

quent sources of trouble are compression joints in tubing. Usually such leaks can be stopped permanently by running back the coupling nut and straightening the tubing so that the ends come together evenly.

If you find it necessary to solder the gas tank, remember that a mixture of gasoline fumes and air is dangerous. One safe way of ridding the tank of fumes before soldering is to drain the gas and mop out the inside of the tank with a cloth. Tie the cloth onto a stiff brass wire and bend the latter so as to get at every

part of the tank. Never use a steel wire. Next, connect a length of rubber tubing onto the tank outlet and run it outside the boat to a point lower than any opening into the boat. Use a tire pump



and a tight improvised coupling at the filler hole to force a stream of air through the tank. After a few minutes pumping the dangerous fumes will be displaced.

The steering gear and rigging, Fig. 10, may need nothing more than a close inspection. See that the rudder has not been weakened by rust, if it is steel, or by rot if it is wood. You may find large cracks between the sections of a wooden rudder. The remedy is to take the rudder entirely apart and refasten it with new through bolts. Looseness in the rudder bearings sets up vibrations in the rudder which will reduce the speed of the boat seriously. Often, in keel sailboats, a lower rudder bearing in the form of a lag screw is employed. If this is loose, the surest remedy is to replace it with a machine screw. Bore a hole through the keel at right angles to permit placing of a nut. The hole can be plugged up after the nut is in place. If your rudder is of the inboard type, repack the stuffing box. Many an irritating rudder-post squeak has been stopped by the installation of a grease cup at the top rudder-post bearings.

(To be continued)

## Tent Attached to Sand Bags on the Beach

Instead of using stakes to anchor a tent or sunshade on a beach, where the soil is loose and a wind is likely to cause the stakes to loosen, try sand bags. A strong ring to take the tent rope can be attached to each bag, near the mouth.



When soil is too loose to hold tent stakes, substitute large sacks filled with sand

## Creeping of Washer Is Avoided When Set on Perforated Mat



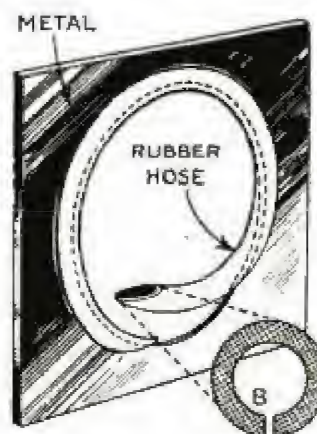
This mat will keep your washing machine in position, yet allow it to be pushed about

To keep your washing machine from creeping or rolling when in operation, cut a circular mat from a piece of discarded linoleum and make four small openings in it to take the casters. When the machine is rolled onto the mat, the casters will drop into the openings and remain in position unless the machine is deliberately pushed.

## Grommet for Opening in Metal from Rubber Hose

When tubing or cables pass through large openings in metal, grommets to line the holes to prevent chafing are made easily from pieces of rubber tubing or hose. The rubber is slit along one side to slip over the edge

of the opening, and the ends are cut at an angle to provide a lap splice, rubber cement being applied to the edges of the latter to hold them securely.





## Simple Photo Press Assembled from Two Wood Blocks



*This photo press is easy to make and costs no more than the price of two bolts and hardwood blocks*

Combining low cost with simplicity of construction, this photo-drying press is assembled from two wood blocks 2 in. thick, which are clamped together with two bolts and handled nuts of the type used by wagon makers. When drilling the holes for the bolts, square up the blocks exactly the same size, lay one on top of the other so that the holes will be in the same position in each block. Then, if they tend to warp in use, you can turn them over with the warped side next to the photo print. It is necessary, of course, to use blotting paper between the print and the blocks.

Ivan Grosvenor, Richmond, Ind.

## Small Plants Sprayed Quickly with Whisk Broom

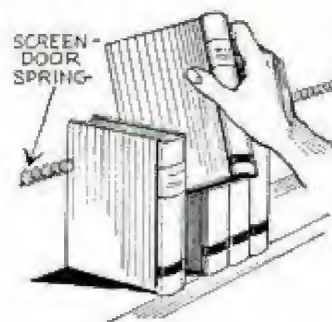


If you have a number of plants to spray and there is no sprayer at hand, you can do the job with a whisk broom. Just put the spraying liquid in a pan, wet the end of the

broom and then push it across the edge of the pan as indicated. You'll be surprised how efficiently you can spray a plant after a little practice.

## Coil Spring Keeps Books Upright on Workshop Shelf

To keep books and catalogues from slipping sideways on his workshop shelf, one home craftsman stretched a screen-door spring on the wall across the rear of the shelf as indicated. When the edges of the books are pushed into the open coils of the spring, it keeps them in position.



## How to Splice Extension Cords



When you need an unusually long extension cord, and have to plug two of them together to get the necessary length, tie the two ends as indicated in the photo. Then, if there is any unusual strain on the two cords it will be taken by the knot, which prevents the plugs from being pulled apart.—Dan Marvosh, Flint, Mich.

## Brush Supported on Strainer in Paint Can

When using water colors or paints, take a small strainer and suspend it inside the container with lead wires as indicated. The wires allow the strainer to be suspended at any depth by

merely bending them over the edge of the can. The strainer will prevent the brush from being dipped far enough into the paint to get the ferrule dirty.



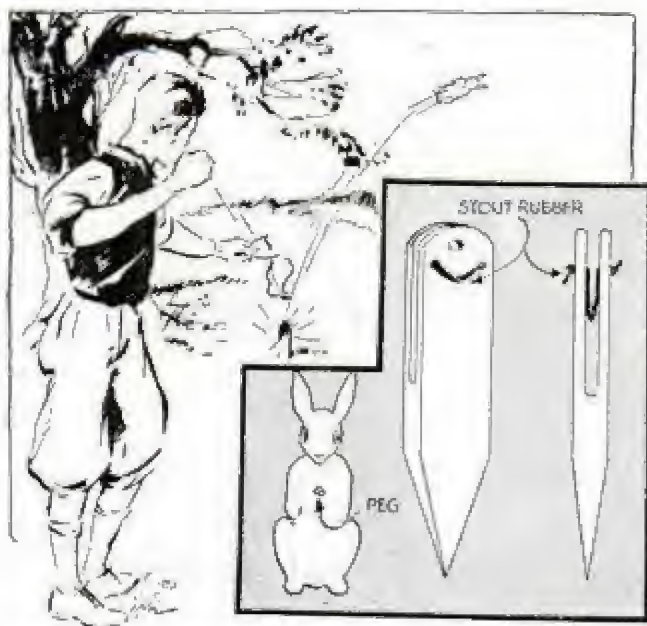


A diagram showing a rope tied in a knot on a curved surface. An arrow points to the knot, and another arrow points to the rope's path.





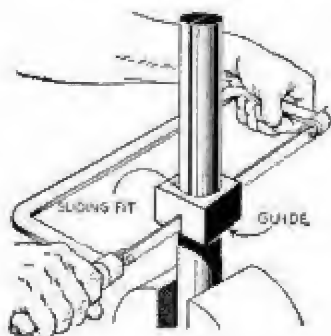
## Realistic Jumping-Rabbit Target Improves Slingshot Practice



*When you score a direct hit on the rabbit, it jumps into the air in a realistic manner*

You'll have a lot of fun with this rabbit target, which jumps high into the air in a lifelike manner when a hit is scored. The target consists of a jig-sawed rabbit and a slotted stake or support. To set the target, the rabbit is pushed into the slot against a strong rubber band stretched across the slot and anchored in two holes by knotting the ends as indicated. A peg projecting from the front of the rabbit engages a third hole in the stake to hold it. When the target is hit, the peg is forced out of the hole and the rubber band pitches the rabbit into the air.

## Shafting Is Slotted Lengthwise with Aid of Hacksaw Guide



This hacksaw guide for cutting metal shafts and tubing lengthwise is simply a metal or hardwood block that slips over the work and has a slit to take the blade. The guide

rides the back of the blade and follows the cut so that all the operator has to do besides working the saw is to keep the cut vertical. By using a guide pin to engage a cut already made in the shaft, and stop-

ping each cut near the lower end, it may be sawed into any number of pieces.

—Charles E. Kew, Los Angeles, Calif.

## Decorative Lamp Shade Is Made with "Cellophane" Ribbon

All you need for this attractive lamp shade is a wire frame and a couple rolls of colored Cellophane ribbon, which you proceed to weave over the frame. The design and beauty of your



shade are determined to a great extent by the amount of ribbon that you use and the angle at which it is wound. This should be done so that no space is left open.

## Simple Dropper for Liquids



Bent to an L-shape, a small glass rod provides a good guide for dropping or pouring liquids from bottles. The rod is inserted into the bottle neck, and when the bottle is tilted, the liquid flows down the rod as indicated. The

rod should be about  $\frac{1}{8}$  in. in diameter and 1 to 2 in. long.—Walter E. Burton, Akron, O.

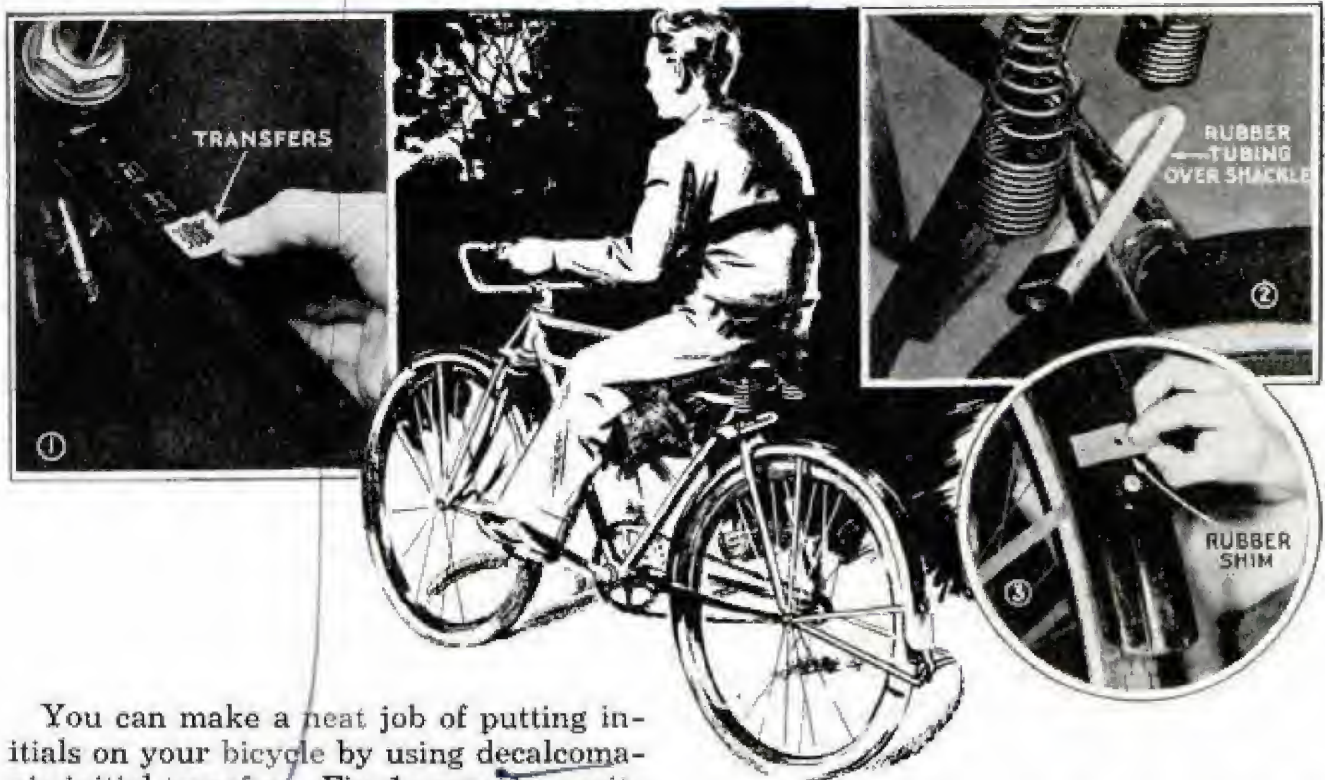
## Auto Casing Provides a Buffer for the Camp Ax

Splitting tent pegs when they are driven with a camp ax, can be avoided by using this buffer, which is a piece of auto casing. It is held over the blunt end of the ax by a wide rubber band.





# Three Handy Ideas that Will Help the Cyclist



You can make a neat job of putting initials on your bicycle by using decalcomania initial transfers. Fig. 1 suggests a suitable location for the letters, on the top bar of the frame. If you carry a lock regularly, slip a length of rubber tubing over the shackle and then snap the lock over the rear fork under the saddle as in Fig. 2. You'll always know where your lock is and it won't rattle. A clattering mudguard

may be silenced by placing a rubber shim cut from inner tube under the guard between the latter and the supporting frame as in Fig. 3. Don't neglect to use a lock washer under the nut when you tighten the assembly in place.

—Raymond B. Wailes, Bethesda, Md.

## Colorful Slip Covers Improve Appearance of Iron Beds

The appearance of old iron or brass bedsteads, used in summer homes, cabins or children's rooms, can be improved greatly by slip covers of striped awning cloth, or plain canvas which is bound with bright tape. Cretonne, chintz or gingham to match the window drapes also creates a pleasing effect. The same is true of colored burlap, crash and other fabrics of similar body. To make the covers, cut a length of material for each side of the head and foot of the bed, shaping it to fit the top. Allow a small amount for seams and sufficient extra to extend over the top and around the posts. Sew the pieces together on three sides and bind with tape, leaving openings at the upper corners for knobs to project.



Striped awning cloth, cretonne, chintz, gingham and even colored burlap make attractive coverings

When packing bottles for a trip, dip the tops in melted paraffin, getting it well around the stoppers to avoid any leakage.



# New "ALBUMS" for



WHETHER you're a photo fan or somebody who likes to keep pictures around to show friends, here are several suggestions on how photos can be displayed to advantage. For the den, a photo-covered screen may take the eye and it's certainly a novelty. Or, any group of pictures may be arranged artistically under the glass of a serving tray, although perhaps you prefer a single enlargement for this purpose. Then there's the idea of photo transparencies on a lampshade, or a photo checkerboard.

The essential thing is to get some enlargements with the principal point of interest in each one as near uniform size as practical. Making up the photographic screen in Fig. 1 is a simple process, although the arrangement of the photos should be worked out very carefully beforehand. An excellent method of mount-





# *your* SNAPSHOTS



ing the prints on the screen is to brush thin muslin onto the surface with thinned vegetable glue. When this is dry the prints are dampened, placed in position and rolled down to remove all air bubbles and enable the glue to obtain a firm hold.

A photo-mural such as that shown in Fig. 2 is made by much the same process, except that as a backing for the prints you would use plywood or hard-pressed board nailed or screwed to the wall at the edges. The screw or nail heads are then covered with a black molding. The mural can be in sections, as shown, or it may extend around the four walls of the room at eye level.

The foundation of a photographic lampshade, Figs. 3 and 4, is merely a wire shade frame. Paper templates are cut to the size of each panel of the frame, the desired negatives are selected and the enlarger is focused on the templates until the picture is composed to your liking. Then instead of using the ordinary enlarging paper, you make the exposure on safety film, which is then developed in the regular way to give a positive transparency. The latter is then mounted on the wire frame with cellulose tape or the edges can be punched and laced with ribbon or leather. Or, you can mount such photo transparencies on clear, translucent lampshades as shown in Fig. 3. Figs. 5, 6 and 7 suggest methods of decorating trays and making photographic checkerboards. The latter are simply mosaics of small prints trimmed square and placed under glass.





## How to Produce Relief Lettering with a Jig Saw

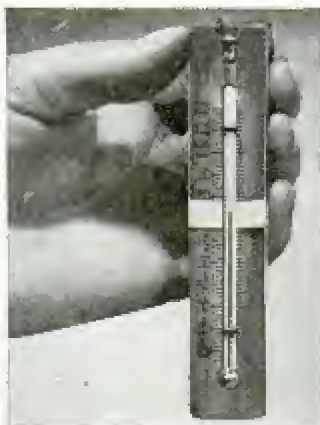


*First dip letters in the color to show on the edges, then apply printers' ink to the upper surfaces*

I have found that a laborsaving method of producing relief coloring on jig-sawed letters is to cut them out, Fig. 1, dip them in paint of a color that is to appear on the edges, Fig. 2, let them dry face up and then coat the upper surfaces with printers' ink. This can be applied quickly with a roller as in Fig. 3, and can be purchased in a variety of colors.

—Jos. L. Horton, Cleveland, Ohio.

## Correct Developing Temperature Marked on Thermometer



To see at a glance whether or not your photo-developing solution is at the correct temperature, wrap a narrow strip of white paper around the thermometer behind the tube as indicated. Apply the

paper so that it covers the 65° mark. If the end of the mercury column can be seen in the space occupied by the paper the temperature is within the correct range.

## Attaching Neck Strap to Camera

If you are a miniature camera enthusiast who likes to carry the camera around without a case, here's a good method of attaching a neck strap to the camera so that it will not be lost. A thumbscrew that fits into the tripod socket of the camera is drilled to take the strap or cord. The edges of the hole in the wing should be filed smooth so that they will not cut.



## Nail Heads in Finished Work Hidden under Chip



Instead of countersinking a nail head in work to be varnished or waxed and then filling the hole, which often shows, one craftsman cuts a V-shaped chip in the surface of

the work with a sharp knife or razor blade. The chip is pried up carefully at narrow end, the nail is driven under it, and the chip is pushed back into place after applying a tiny drop of glue to hold it.

## Galoshes Hung from Wire Line

Rather than allow the children to pile their rubbers and galoshes in a corner of a school-room or scatter them over the floor, provide the cloak rooms with





the type of hangers shown in the photograph. This consists of a length of wire threaded through the springs in clothespins and stretched taut across the cloak rooms. When galoshes and rubbers are hung up in this manner they are out of the way and dry thoroughly.

### Router Bit from Pin Drill

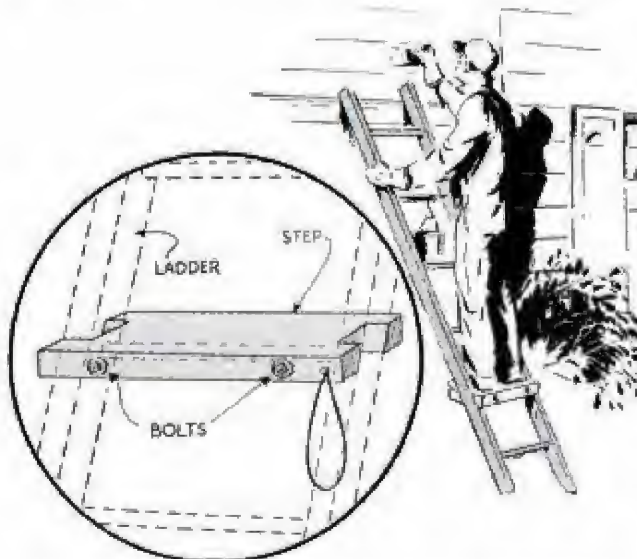


When you need a small router bit for some delicate work, and none is at hand, just take an old pin drill of the type that has fluted sides and grind off the end flat. A bit of this type is handy for very small work and can be used up to a depth of  $\frac{1}{32}$  inch.

—Harold Glaser, Corona, L. I., N. Y.

### Movable Step on Ladder Round Easy on Your Feet

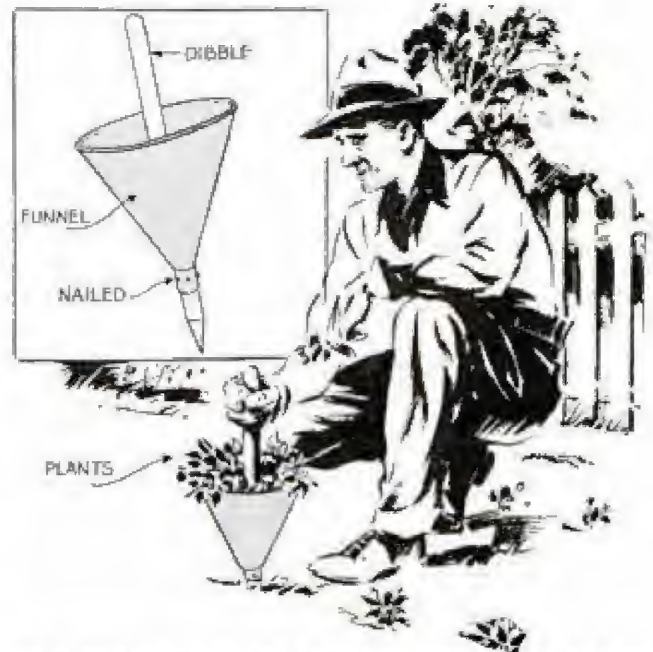
Workmen who must stand on a ladder for long periods, will find this movable step helpful in easing the strain on their feet. It is cut from a 3-in. block to the shape



*You'll find this movable, flat step much easier to stand on than a ladder round*

shown, and is reinforced with two bolts against splitting. In use, it is placed over the ladder round from which you are working, the notched ends fitting the ladder sides to prevent tipping.

### Funnel on Plant Dibble Holds Small Seedlings



*This dibble carries the plants so that you don't have to walk back and forth after a supply*

For transplanting cabbages, tomatoes, etc., fit your dibble with a large funnel as indicated and you can carry the plants right in it. This enables you to keep the plants at hand as you work down the row, and the roots are not unduly exposed to the sun, which sometimes happens when the plants are left in a pile on the ground.

### Mildew Removed from Leather

Mildew that forms wide patches on leather-bound books, traveling bags and other leather articles can be removed with vaseline. Rub this over the spot liberally, let it remain for a while and then wipe thoroughly with a cloth. This treatment also tends to preserve the leather by renewing its oil content.

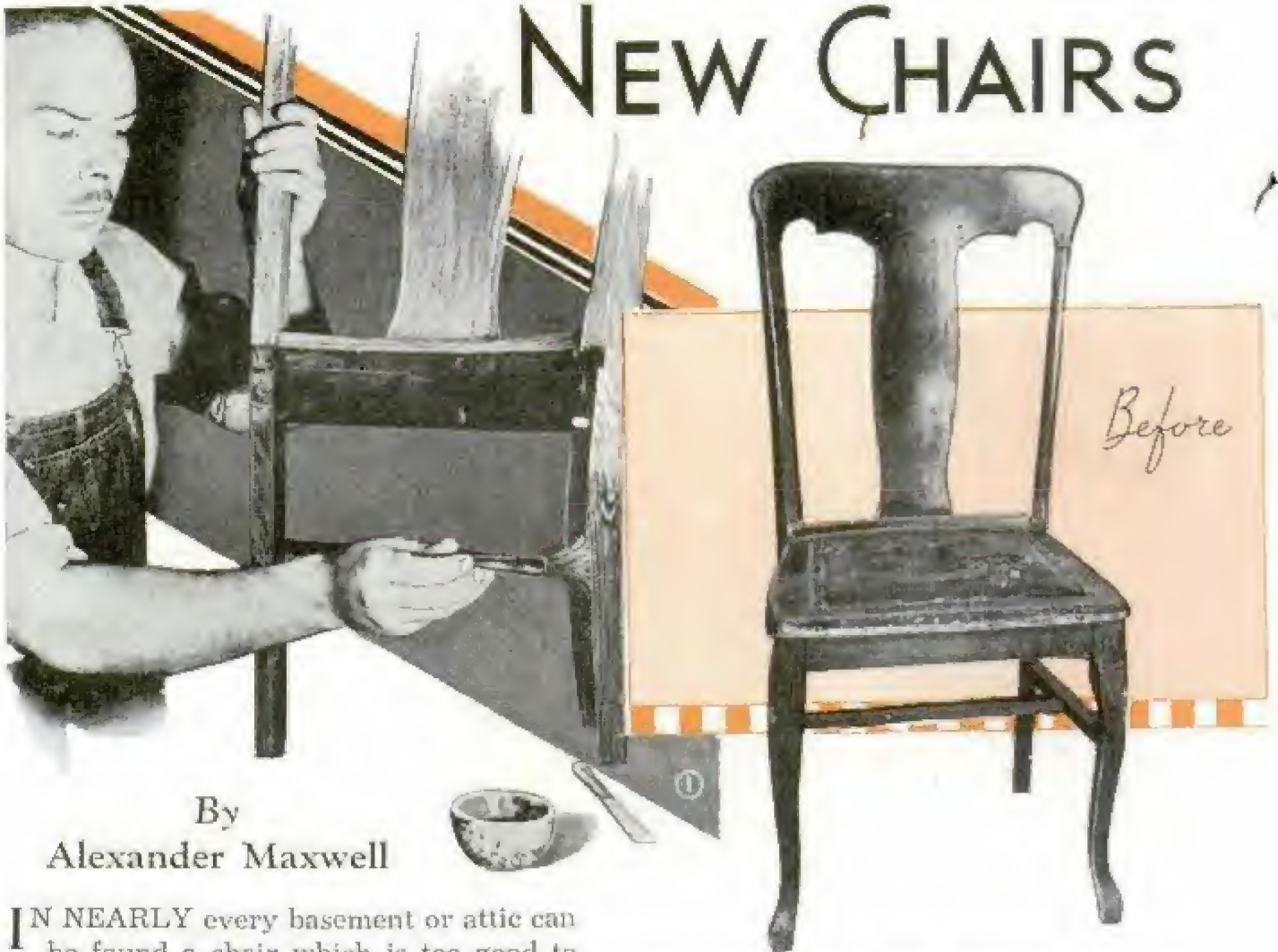


—Walter Burton, Akron, Ohio.

☞ To save money on window shades, purchase them long enough so that the bottom may be cut off and hemmed when it is faded or torn.



# NEW CHAIRS



By  
Alexander Maxwell

IN NEARLY every basement or attic can be found a chair which is too good to discard, yet too scarred and worn from long use to be presentable. The varnish is probably black and checked, the joints loose and squeaky and the seat tattered and broken. To renew such a chair you start by dismantling it completely. When you find screw heads concealed by round wooden plugs, bore a hole into the center of the plug, for which a metal drill should be used. The remaining pieces can be removed easily with a screwdriver. A dow-

eled joint which has opened must be coaxed apart with light taps of a wood mallet. Removing the old varnish or paint need not be a messy job. Follow the directions on the can, as all varnish and paint removers are not alike. One simple trick that saves a lot of trouble is to apply remover to only half of the piece at a time. This leaves you a dry, clean section as a handhold. When the first half is finished use it for a handle and work on the other





# from OLD...



end. Once the varnish is off, take the whole thing outdoors and scrub each part thoroughly with gasoline. Should the chair be made of oak there are likely to be sharp, angular edges full of splinters. If you have a shaper or a shaper attachment for your drill press you can round these edges neatly as in Fig. 7. Doing this by hand with a scraper and sandpaper takes longer but is just as effective.

When re-gluing the frame, use casein



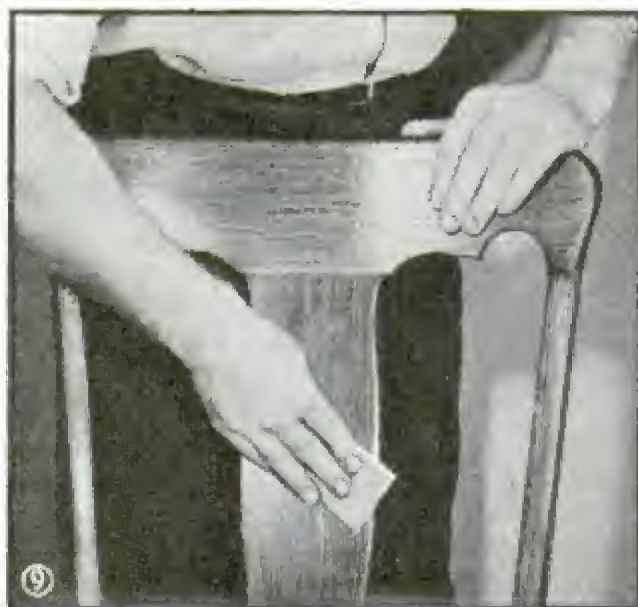
glue and bar clamps as in Fig. 2. Take out all the old dowels and replace them with new stock. Flatten each dowel slightly to allow the escape of glue entrapped in the holes when the joints are drawn up. If this is not done the wood may be split because of the pressure when forcing the parts together. Thoroughly clean the meeting surfaces of the joints. A casein-glued joint should have both surfaces lightly coated with glue and be allowed to set for 5 or 10 minutes. Then more glue is applied and the parts drawn up tight with clamps. It is better to glue and clamp only one or two







*Rough edges can be rounded neatly with a drillpress shaper attachment or sandpaper*



joints at a time than to take them all at once. When clamping up the final assembly, set the chair on the floor and see that all four legs remain on the floor when the clamps are drawn up. Wipe off all surplus glue with a damp rag or a toothbrush. With oak, no pads need be used under the clamp jaws but if the frame is walnut, gumwood or mahogany, it is better to place a felt pad between the jaws and the wood to prevent marring the surface. Leave the frame in the clamps for at least 24 hours.

While the frame is drying, you can be working on the seat. Smooth up the edges of the seat frame with a plane as in Fig. 3,

and finish with sandpaper. It's likely that your local upholstery shop can furnish you odds and ends of material for upholstering the seat. Webbing comes first and it must be stretched as tight as a bowstring. Make a webbing stretcher and use it as shown in Fig. 4. Double back the ends of each strip of webbing and use tacks long enough to hold securely. On top of the webbing goes a burlap cover, which is tacked lightly in place as in Fig. 5. The padding is upholsterers' moss. Before inserting the latter, tack the cotton batting to the back of the seat frame so it will fold forward. Lay the moss in place and pick the bunches apart till it fluffs up into a springy mass, then bring the cotton batting forward and tack to the underside of the seat frame. The muslin cover comes next. Tack the back, then bring it over to the front, drive a single tack at the center and work in both directions. With the front tacked, adjust the padding by inserting your hand under the batting as in Fig. 6. Finally trim the sides of the batting, fold down and tack to the edges of the seat.

The covering may be tapestry, mohair or rep, whichever you choose. Cut the piece slightly oversize to allow for holding the edges under, then start the tacks at the back and work forward, Fig. 8. Keep the pattern straight and the wrinkles smoothed out. The trick in getting a smooth, neat corner is to make a series of small pleats in the cloth and tack each one before the next is made. The number of

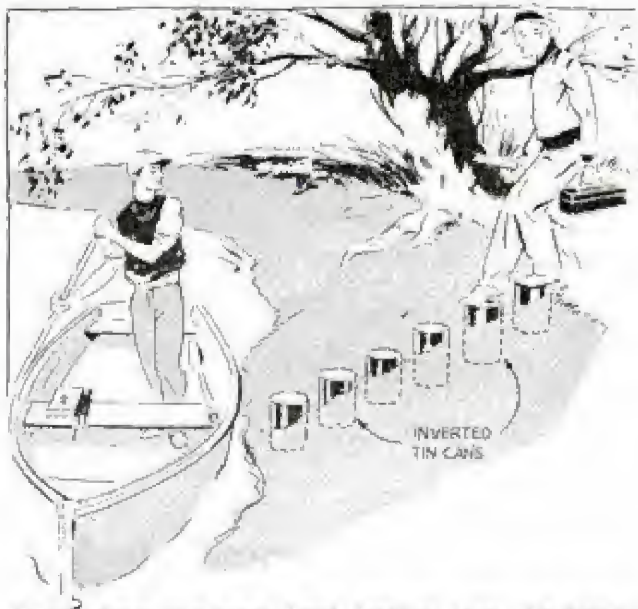


pleats at each corner is determined largely by the thickness of the material. A dust cover of black cambric tacked to the underside of the frame completes the seat.

The simplest finish to apply to the chair frame is a walnut or oak varnish stain. Dilute the stain as it comes from the can with one-fifth its volume of turpentine. Lay on a thin coat, Fig. 1, brushing it well into the wood, and let it dry for two days. Then rub lightly with fine steel wool until all the luster is gone. Put on a second coat of the varnish and repeat the rubbing. Apply the third coat undiluted. When thoroughly dry rub first with fine steel wool then brush away the dust and continue the rubbing with a felt pad, Fig. 9. The heat generated by rubbing with the pad softens the surface of the varnish and causes it to take on a velvety luster. Finally, rub down with furniture wax and polish with a fleece buffer. Last of all, screw the seat in place and insert new screw-hole plugs which have been stained and varnished to match the chair.

## Emergency Stair to Boat Landing

When a camp site is located temporarily where a steep bank leads to your boat, just take a few empty cans, invert them and set them in the bank as indicated to serve as a stairway. It is best to first fill the cans with dirt or push them deeply into the ground so that the soil tends to support the bottoms to keep them from pushing in when you step on them.



When there is a steep bank leading from the boat to your camp, set inverted cans in the bank as steps

## "Loaded" Hose Removes Scaffold without Damage



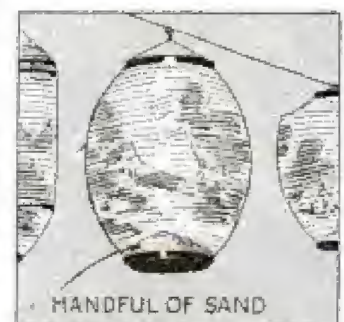
Dismantling a scaffold with a "loaded" rubber hose which distributes the blow and avoids splitting

When a scaffold or concrete form is to be dismantled with as little damage as possible to the boards, a length of rubber hose is often better than a hammer. Fill the hose with shot or sand and plug the ends. The hose distributes the blow over a larger area of the work so that undue splitting of the boards is avoided.

## Chinese Lanterns in Garden Have Sand "Ballast"

During a garden party, where the lawn was illuminated by Chinese lanterns containing candles, a double handful of sand was placed in the bottom of each one to stabilize them in a strong breeze. Of course, the wind swayed them some, but the weight of the sand kept them from swinging at an angle sufficient to allow the candle flames to ignite the paper sides.

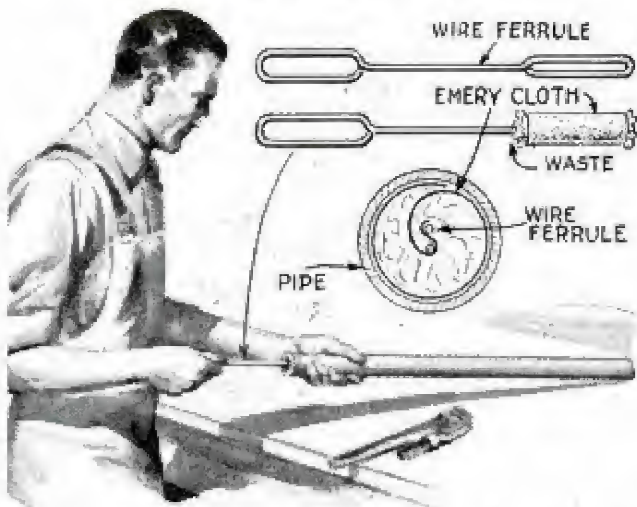
—Dale R. Van Horn, Lincoln, Nebr.



⌚ When peeling onions set the electric fan near by to blow the odors away, and it will prevent much "weeping."



## Simple Tool Removes Corrosion Inside Used Pipe



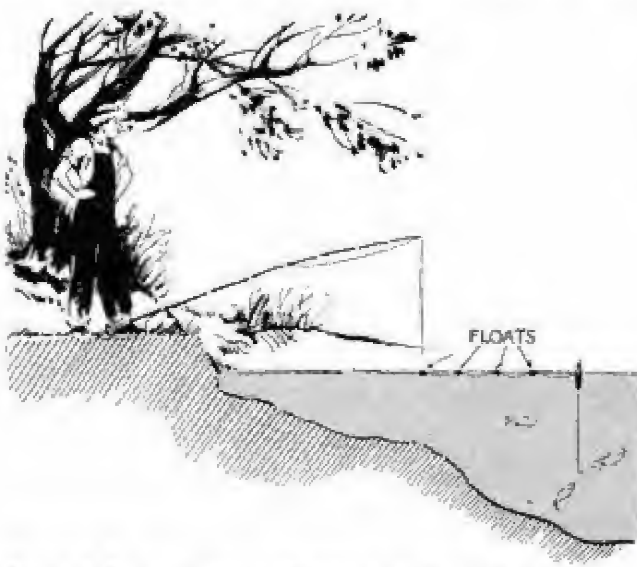
*Waste and emery paper wrapped around end of wire handle quickly remove corrosion inside used pipe*

If you have a few pieces of old pipe that need cleaning on the inside, you can do the job efficiently with this tool. It is nothing more than a length of heavy wire bent as indicated and having cotton waste around one end to serve as a flexible backing for emery paper. The end view shows how the waste and paper are wrapped.

—M. M. Warren, Monterrey, N. L., Mexico.

## Several Floats on Your Fishline Keep Long Line from Sinking

Use several floats on your line when still fishing from the bank of a lake or stream. They will support the line on the surface of the water instead of allowing it to sink and tend to pull the hook close to the



*Several floats on your fishline keep it on water surface and prevent hook from tangling*

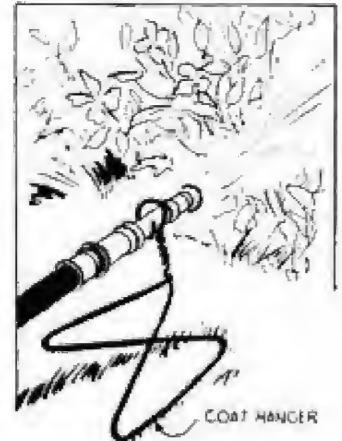
bank. When the line is kept on the surface of the water, minnows playing with the bait cannot tangle the hook into it, which they often do if it sinks.

—Hobart Mark, Spencerville, Ohio.

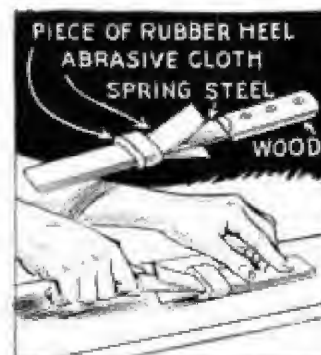
## Nozzle of Lawn Hose Supported on Wire Coat Hanger

When you want to direct a light spray of water on shrubs, flower beds, etc., and there is nothing at hand to support the nozzle of the lawn hose, get a wire coat hanger and bend it in the manner indicated.

This may not support the hose if the water is turned on full, but will do the job when spraying lightly.



## Holder for Strip Abrasives

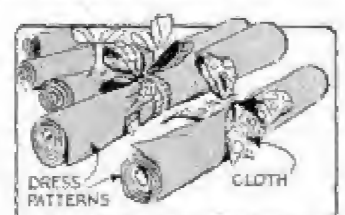


Strip abrasives stretched over this flexible holder are handled easily for all kinds of work. The holder is a piece of thin spring steel cut to the length and width desired and fitted with a wood handle.

In use, the abrasive strip is folded over the blade of the holder, and a rubber ring is pushed over it to keep the ends in place. The ring is a piece of rubber heel carved out in the center to slip snugly over the assembly.—A. H. Waychoff, Tempe, Ariz.

## Identifying Dress Patterns

After you have finished making a dress, roll the pattern and tie it with a piece of the same material. When it is laid away with



other patterns, the cloth will identify it by serving as a reminder of the last dress.



# The Latest HASSOCKS have storage space

Disguised drawer fronts or hinged tops conceal handy spaces to put books, sewing, baby's toys, etc.

By WAYNE C. LECKEY

**Y**OU'LL find these invitingly comfortable hassocks with their cleverly concealed storage space convenient and very attractive. They can be made easily right in the home shop, using inexpensive, scrap stock for the frames, and tailoring to suit.

Of the three designs presented herein the one shown in Fig. 2 is the simplest and requires the least work to complete. To make this hassock, a box-shape frame should be made first following the dimensions given in Fig. 5. It is best to use plywood for this as it is strong and will tend to keep the weight



of the finished hassock at a minimum. You can form the corners for the

frame from a length of common 2 by 4-in. white pine, making the required right-angle cuts for the sides by tilting the saw table. Do not round the corners until after assembling, which is then done with a hand plane to remove the waste and

a sanding block to smooth flush with the sides. A  $\frac{3}{8}$ -in. plywood bottom is then fitted, nailing through as shown. A lid is cut to conform with the top of the box and in turn is glued to a 14-in. framework, roughly cut and joined from  $1\frac{1}{8}$ -in. stock. This is centered to allow a  $\frac{1}{2}$ -in. margin all around. Before upholstering, the inside of the box as well as the underside of the top should be enameled bone white, lightly rubbing between coats with fine steel wool.

Your first step in upholstering is to form a roll edge around the top as shown in Fig. 4.





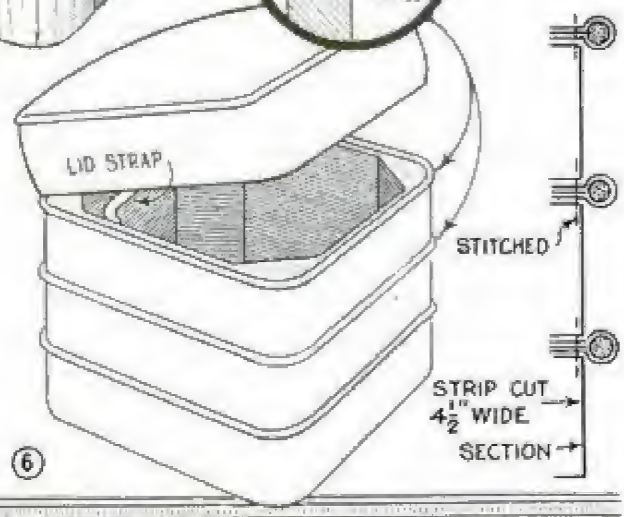
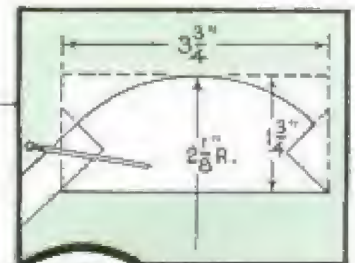
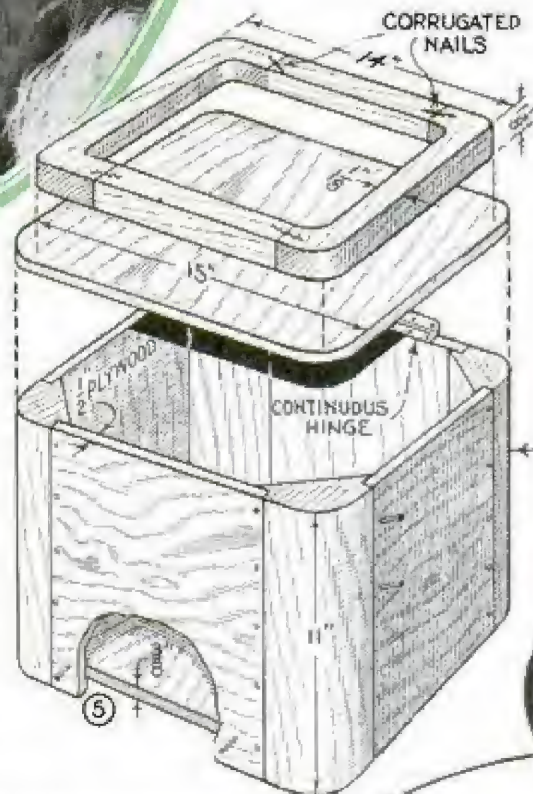


For this you will need a strip of burlap about 5 ft. long and  $4\frac{1}{2}$  in. wide. By hemming the edges evenly you will be able to make a neater roll. Begin tacking the edge of the burlap along the outer edge of the frame first, then add enough tow filling to produce a uniform roll about  $1\frac{1}{2}$  in. in diameter and, finally, gradually tack the other edge along the inside as shown in the insert detail, Fig. 4. Better results will be had at the corners if you tack these after forming the sides. Let the roll overhang nearly even with the edge of the lid board. In this manner when the cotton is added, the top will be even with the sides of the hassock. Hair filling is generously added to the top of the seat and is covered with several thick layers of cotton.

Now for making your box covering: Imitation leather can be used for the top and welt seams, with a dark cloth fabric for

the sides. This arrangement is preferred as it makes the hinged top inconspicuous. The cover material is cut 16 in. square, rounding the corners. The border strip is to be cut  $4\frac{1}{2}$  in. wide and is sewed to the top cover with a leather welt between. If you do not have an attachment on your machine for sewing welts, an upholsterer will do this for you quickly once you have the pieces cut. The cover is tacked neatly to the underside of the top, adding a strip of braid to cover the raw edges. The material for the sides of the box is cut up into straight strips  $4\frac{1}{2}$  in. wide and sewed with welts between as shown at Fig. 6. This forms a continuous band which in fitting is first turned inside out and the top welt is blind-tacked around the top edge of the box as shown. With this done, the material

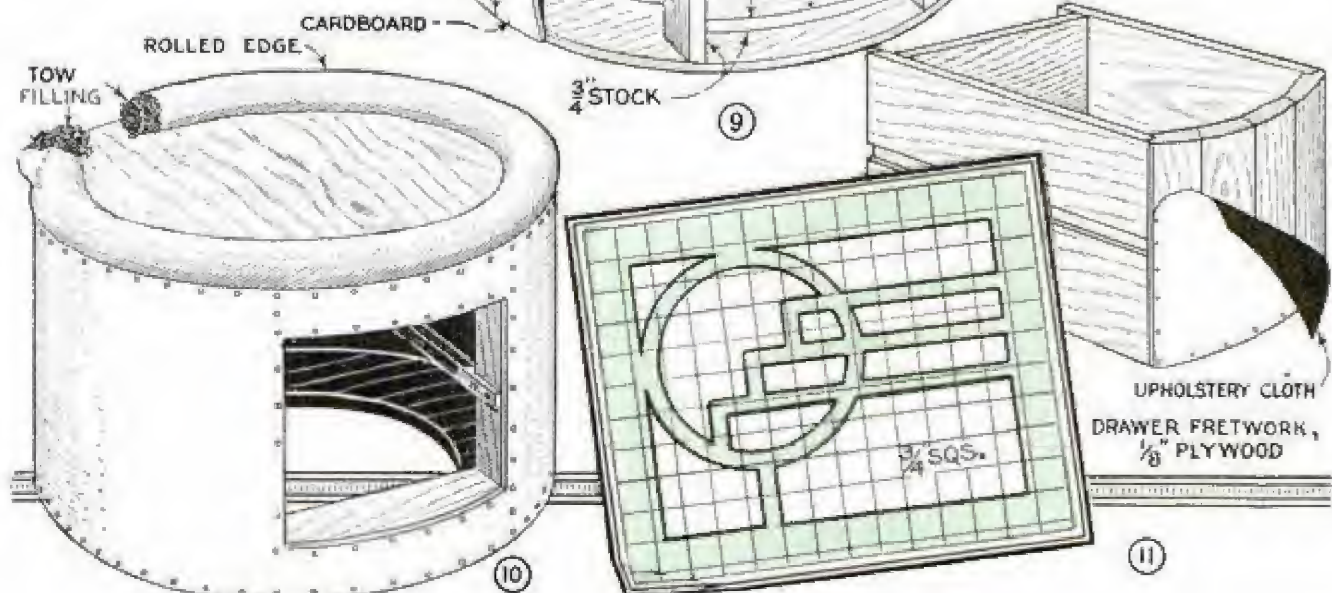
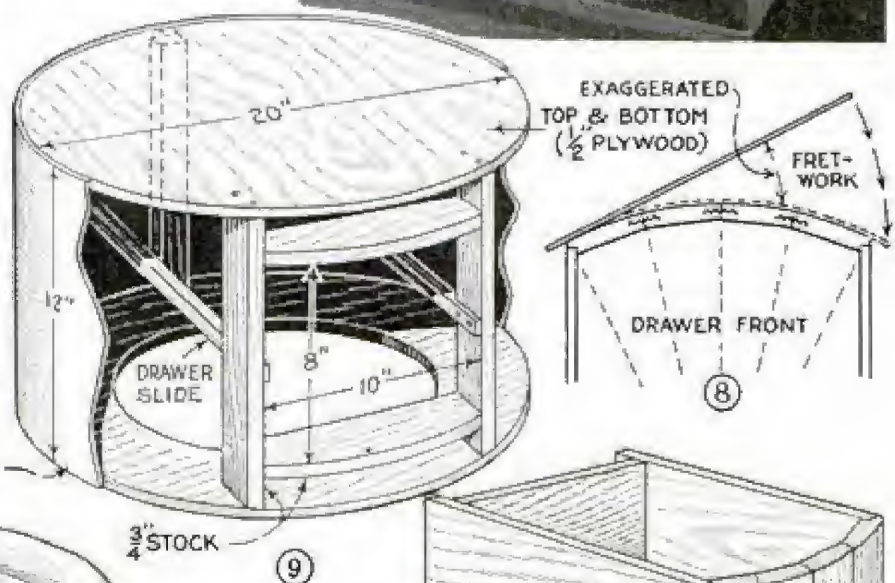
is brought down firmly and tacked to the underside. A continuous hinge supports the top and a lid strap of leather, fastened to the inside, checks it from flopping over, resulting in damage.



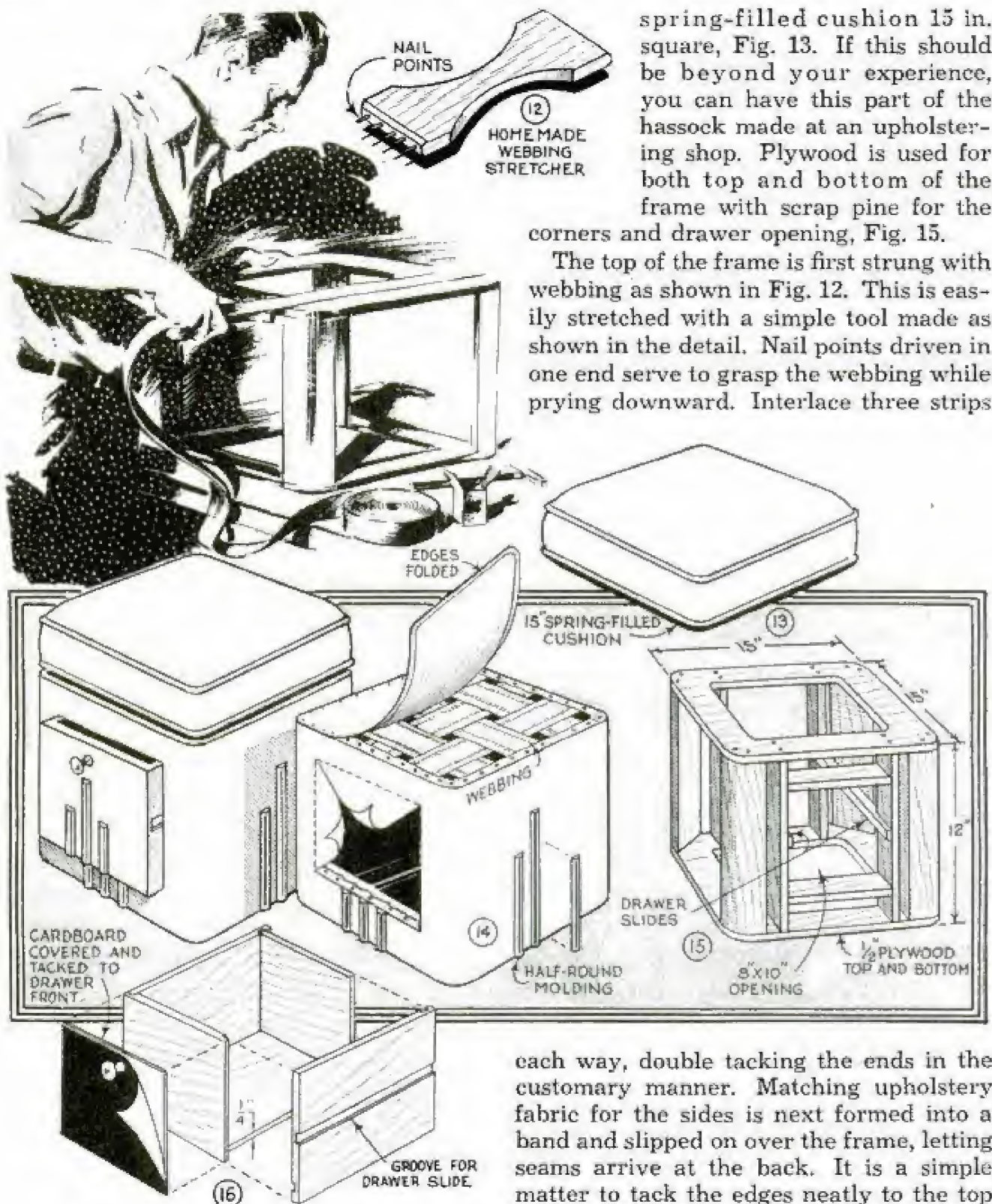


The hassock shown in Fig. 1 is upholstered over a drum-shaped framework consisting of two 20-in. disks nailed to up-rights forming the drawer opening and covered with stiff cardboard tacked to the edges and joined at the back, Figs. 9 and 10. If the center is removed from the bottom disk, it will facilitate fitting the drawer slides. The cardboard over the drawer opening is cut out after nailing has been completed. The slides are fitted after the drawer is fitted to the opening. As described before, a roll edge is applied around the top  $\frac{1}{2}$  in. from the edge. Hair and cotton are used for padding. The cover material should be cut 21 in. in diameter and joined with a welt between to a border measuring about 15 in. Seams in the border should be placed at the back of the hassock. The cloth that covers the opening at the front is slit diagonally at the center and folded and tacked neatly inside.

Fig. 8 details the construction of the drawer and the curved front. Four segments angle-cut 82 degrees, glued and nailed with corrugated fasteners, are sanded to the proper contour to form the curved front. Grooves cut into the sides of the drawers should slide freely. The front of the drawer is covered with a scrap of upholstery fabric over which a fretwork cut from the pattern in Fig. 11, is screwed to overlap evenly on all edges. The fretwork should be painted, of







course, beforehand and the screw heads countersunk, puttied and touched up. Use a chrome pull on the drawer. The four legs for the hassock consist of two thin disks, glued and nailed to opposite sides of a thick center, one beaded on the edge as shown in Fig. 7. These are finished bone white and are fastened, evenly spaced, with screws in counterbored holes.

The design shown in Fig. 3 calls for a

spring-filled cushion 15 in. square, Fig. 13. If this should be beyond your experience, you can have this part of the hassock made at an upholstering shop. Plywood is used for both top and bottom of the frame with scrap pine for the corners and drawer opening, Fig. 15.

The top of the frame is first strung with webbing as shown in Fig. 12. This is easily stretched with a simple tool made as shown in the detail. Nail points driven in one end serve to grasp the webbing while prying downward. Interlace three strips

each way, double tacking the ends in the customary manner. Matching upholstery fabric for the sides is next formed into a band and slipped on over the frame, letting seams arrive at the back. It is a simple matter to tack the edges neatly to the top and bottom. The webbing is likewise covered, using small gimp tacks. The opening is slit, folded inward and tacked, Fig. 14. The drawer is made as in Fig. 16, allowing ample clearance to slide freely in the opening. A piece of stiff cardboard cut to fit the drawer front, is first covered with fabric glued to the back and fastened with brads to the drawer. The cushion is attached by reaching up through and sewing securely at the center, using a curved needle.



## Simple Valve Stopper for Funnel



When a number of bottles are to be filled by means of a funnel, the work may be accomplished rapidly, and without overflowing the containers, if this small, finger-operated stopper is employed. It consists of a cork ball attached to a wire, one end of

which is bent in a loop to fit over the index finger of one hand. In filling the bottles the funnel is held as shown, the finger being raised or lowered to operate the valve.

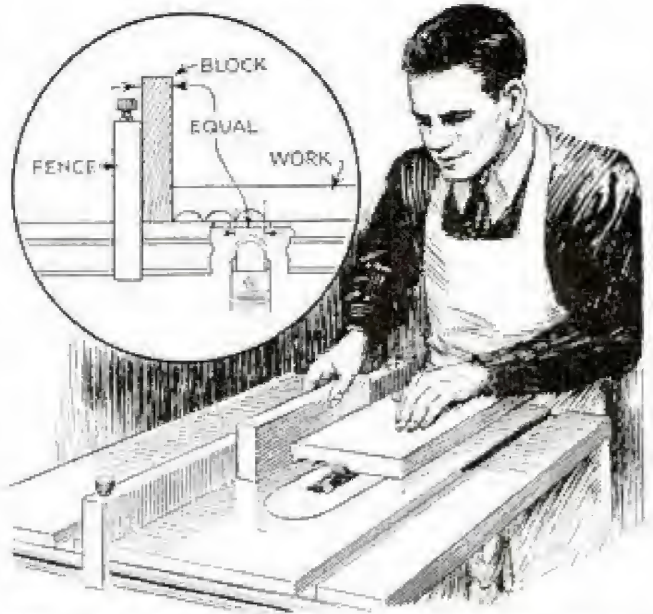
## This Portable Camp Stove Is Light in Weight

Here is a handy stove that one camper made from an old oven such as used on kerosene and gasoline stoves. The top of the oven is cut out and fitted with a grating to support cooking utensils, after which the original door of the oven is removed to provide an open front. The pan support inside the oven is cut in two in the center and bent down until the severed edges are about 2 in. apart. This forms the grates of the stove.



*This kerosene-stove oven provides a good camp stove when the top is removed*

## Spacing Parallel Cuts Accurately for Molding Head



*This method saves marking off equal divisions when using a molding head for cove or reed cuts*

The next time you have to make a series of parallel cove or reed cuts with a molding head on a circular saw, try this simple method instead of marking off equal divisions on the edge of the work. After the first cut has been made, hold the work in its present position and move the fence enough to insert a scrap of wood, the thickness of which is the same as the width of the cut or space. This gives you the proper position of the fence for the next cut. The procedure is repeated after each cut, resulting in identical divisions.

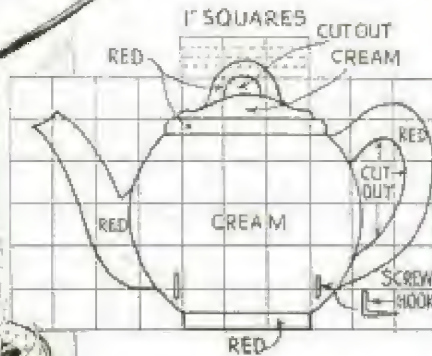
## Testing Board for Camera Bellows Has Photoflood Lamp

Mounted in a porcelain socket on a suitable wood base, a photoflood lamp provides a good tester for camera bellows. The lamp produces a brilliant light that will show leaks that cannot be detected easily by other means. The face of the base which contacts the rear of the camera is lined with black velvet, and the lamp cord is brought to the socket through a hole in the base.

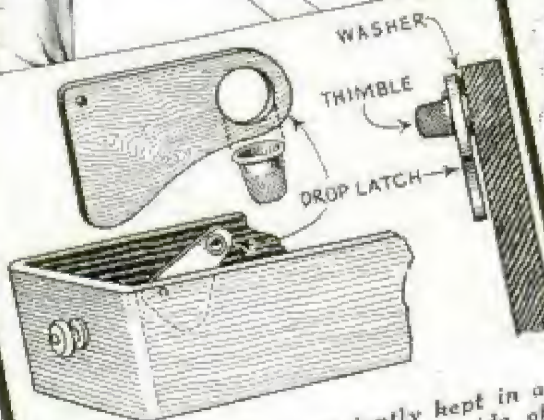




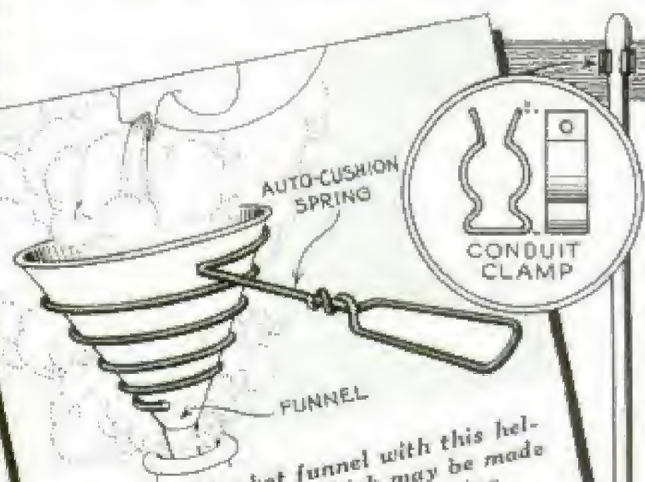
# SOLVING HOME



Sometimes you'll find it handy to slip a large cork on the stirring spoon to keep it floating. And, for hanging hot pads in the kitchen, this little "teapot," jigsawed and suitably painted, is just the thing



Favorite thimble conveniently kept in a simple holder pivoted to the inside of the sewing-cabinet drawer



You can hold a hot funnel with this helical support of wire, which may be made from an old auto-cushion spring



CLOTHESLINE COATED WITH BRUSHING LACQUER



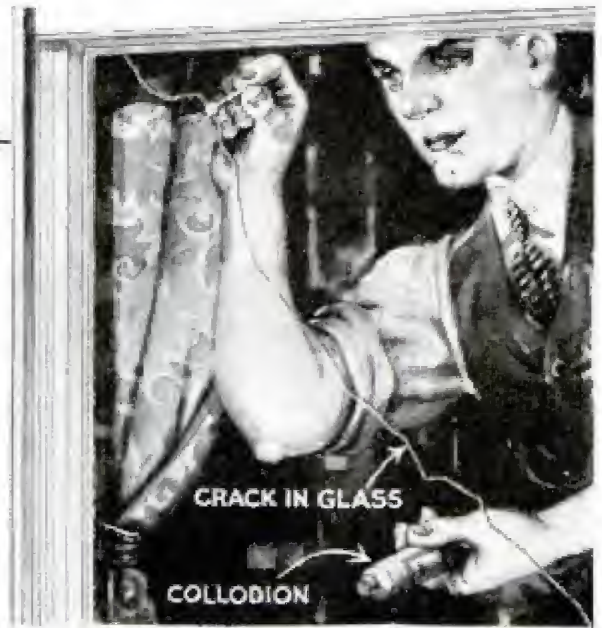
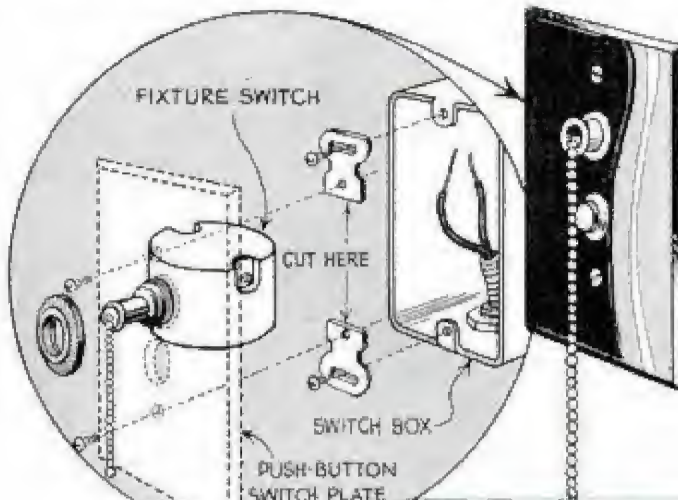
Left, an occasional application of brushing lacquer or shellac on a wire clothesline prevents rust stains on clothes and permits quick and easy wiping. Center, as a temporary repair, ordinary nail polish will often mend small breaks and pinholes in hot-water bottles. Dry thoroughly inside, spread the break, and work the polish in with a toothpick so that it "anchors." Right, single-screw conduit clamps, obtainable at electric shops, make good broom holders



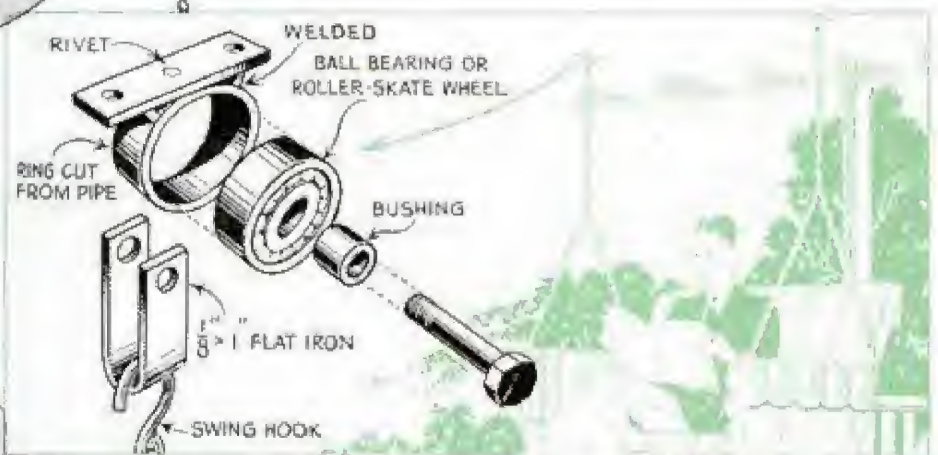
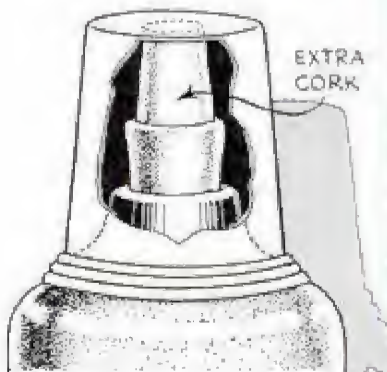


# PROBLEMS

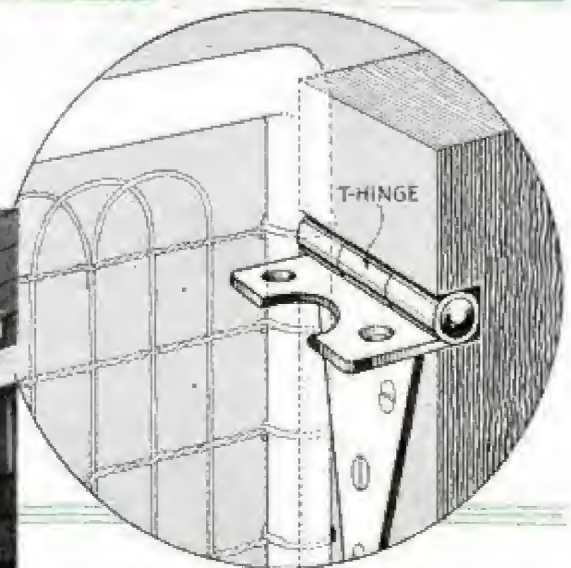
When you want the youngster to be able to operate a wall switch without climbing on chairs, substitute a toggle-fixture switch of the type shown below for the usual flush wall switch. The metal tabs of the latter are cut off and retained so that the plate can be fastened



Above, crack in windowpane can be filled with collodion which is applied on both sides, providing an airtight joint. Below, cure creaking porch swings by providing ball-bearing hangers through which the swing hook is slipped



Extra cork inserted under the screw cap on an insulated bottle keeps the regular cork in place. The photo below shows how simple roll-up shades can be fashioned from strips of wood and tape. In this case wood lath was used



Strong gate latch formed by filing notch in large T-hinge. Ends may be turned up so that pressure of gate against latch will raise it





*It looks easy to drop a hoop over the balloons, but just stand off and try it once*

## "Balloon Dodger" Hoop Game Tests Your Skill

An interesting and amusing game that looks easy but proves difficult to score may be made from several sausage-type toy balloons. These are inflated and painted to resemble caricatures, after which they are attached to a base. In playing, the contestants stand at a predetermined distance from the balloons and endeavor to toss embroidery hoops over them. As the balloons move at the slightest touch, the hoops must drop directly over them to score a point. The game may be rendered more difficult by inflating the balloons so that a hoop will just slip over them.

❏ Keep a package of picnic spoons in your medicine cabinet for dispensing medicine instead of using silver spoons, which tarnish easily.

## Plenty of Fun at a Safe Speed



### MORE BLUEPRINTS ON GOOD SPRING PROJECTS

**"ROAMER"—765 to 770:** Outboard cabin cruiser. 16 ft. long, 66 in. beam. Requires outboard motor of 20 to 36 hp. Set of six prints \$1.00.

**"SEA SAUCER"—893:** 9½-ft. sail boat. Deck, bottom and sides are 3/16-in. plywood. 25c.

**"ZIP," MODEL RACING YACHT—880 to 883:** 50 in. long. Four prints \$1.00.

**17-FT. KAYAK—928 and 929:** Light framework covered with canvas. Two prints 50c.

**LAWN CHAIR—529:** Plain sawed from ¾-in. stock. Easily made with hand tools. 25c.

**ORNAMENTAL WOOD FENCES—640:** Five artistic designs for standard wood stock. 25c.

**VENETIAN BLINDS—926 and 927:** Three different styles covered on two prints. 50c.

*This small car, having a 58-in. wheelbase and 28-in. tread, is very easy to operate and may be powered by a ½ to ¾-hp. gas engine of the washing-machine type. It is equipped with effective brakes and pneumatic tires. Plans show three alternate methods of body construction. Easy to build. Our blueprints Nos. 906 to 909 incl. give you all the information necessary. This set will be sent postpaid on receipt of \$1.00.*



**LAWN AND GARDEN FURNITURE—920 to 922:** Collection of designs for arbor-and-seat combinations and swings. (3 prints.) 75c.

**METAL WEATHER VANES—520:** Scroll-sawed from sheet aluminum. Complete assembly details. 25c.

Any six of these blueprints (not sets of prints) will be sent postpaid upon receipt of \$1.00

Blueprint Department, Popular Mechanics Magazine, 200 E. Ontario St., Chicago

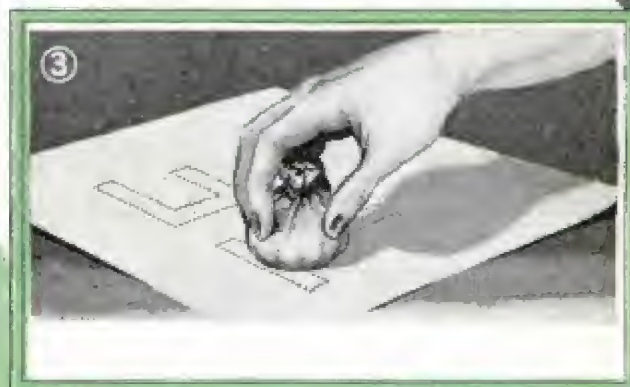




# SHOP NOTES

## Working with GOLD LEAF

GILDING with gold leaf is a fascinating art and although some skill is required to handle this fragile material, a bit of practice will enable anyone to produce excellent results. The necessary materials are not expensive; the gold leaf, a few camel's-hair brushes, and a "pounce" bag will include almost everything needed. Kits can be purchased which contain all the necessary equipment for gilding. The surface to be gilded must be perfectly smooth and nonporous, as any irregularities, even brush marks in paint, will show through the gold leaf. If the surface to be gilded is porous, it must be given several coats of paint, varnish, or shellac. Flat



paints are to be preferred for this purpose. The size alone cannot be depended on to seal the pores, as its only purpose is to secure the gold to the surface. After the latter has been smoothed with fine pumice, be sure that it is perfectly clean and dry, as the gold will stick to a wet surface.

The design which is to be gilded should be laid out on a thin sheet of white paper and the pencil lines perforated as shown in Fig. 1. The back of the paper should be lightly sanded with No. 00 or finer sandpaper to keep the holes from closing. The design paper is then laid in the proper position and rubbed lightly with the pounce bag, as shown







in Figs. 2 and 3. The pounce bag is made by folding up the corners of a small square of cheesecloth, filling with whiting, and tying at the top. The pattern will show up on the work in white. On white work, use a pad of absorbent cotton dipped in powdered charcoal. Now brush a thin coat of gold size on the part to be gilded. This is not to be spread beyond the design as the gold will stick wherever there is wet size. There are two kinds of size, quick-drying or japan size, and slow-drying or oil size. The latter takes about 10 to 24 hrs. to reach the proper condition for gilding, while the quick size will be ready in from 20 to 60 min. However, the oil size will permit a better burnish of the gold. During drying, the work should be protected against dust and lint.

The gold is to be applied when the size reaches the proper "tack" or stickiness. This can be tested by touching the size with your knuckle. It is right when the knuckle sticks very slightly and a little "tick" is heard when the knuckle is pulled away. Experience is the best guide in judging the right time to gild.

Gold leaf comes in books of 25 leaves, each leaf being  $3\frac{3}{8}$  in. square. There are two general types, the plain leaf and the patent gold leaf, which is lightly adhered to a sheet of tissue for ease of application. The ordinary gold leaf cannot be touched or handled, and must be applied directly from the book, or with the gilders' tip, which is a thin, 4-in. brush of camel's hair. To use the tip, draw it lightly across your hair several times and then lay the slightly greasy side flat on the gold leaf, as in Fig. 5. Pick up the leaf and lay it flat over the sized surface, Fig. 4. Avoid crumpling the leaf and be careful not to let the tip touch the size. Do not breathe toward the gold leaf, and avoid drafts. Pat the gold lightly with a pad of cotton and burnish by rubbing lightly with the

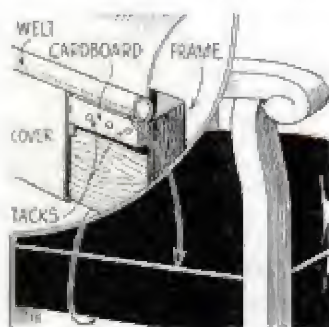




cotton. The size is still wet and the gold is fragile, and too much pressure will ruin the surface. Brisk rubbing without pressure will give a high burnish. Scraps of gold or "skewings" which are brushed off in the burnishing process may be used to patch imperfections, which are called "skippers" or "holidays" in the trade. On a small job, the leaf should be cut to prevent unnecessary waste. The method is shown in Fig. 6. The book is held in the left hand with a piece of stiff cardboard underneath it, and the first piece of tissue folded back to expose enough of the gold leaf for your purpose. It can then be cut with your fingernail while resting your finger on the tissue paper. Only slight pressure is required.

Patent leaf is adhered to a sheet of tissue which may be handled with the fingers. It is applied directly to the work, as in Fig. 7, and patted with a cotton pad to insure adhesion to the size. The tissue is then pulled off with the excess gold still adhering to it. This gold can be used on other jobs. It is not usually necessary to cut the leaves, but if desired, scissors can be used. The gold can be burnished as usual. While easier to apply, patent leaf will not take as high a burnish as ordinary leaf. If the gilded surface will be subjected to wear, it can be given a coat of varnish to protect it. Before applying the varnish, allow 24 hours for the size to dry completely.

## Tacking of Upholstering Material Concealed by Cardboard



In "blind-tacking" borders, which is frequently required in upholstery, the location of tack heads often can be noticed through thin material by a wrinkle or pull in the cloth at each tack. To overcome this, one workman cuts strips of cardboard  $\frac{1}{2}$  in. wide through which he drives the tacks into the border. This gives a straight edge which permits the border to be drawn down smoothly without wrinkles appearing in the material.

## Rope Sling Lessens Hazard in Painting Flagpole



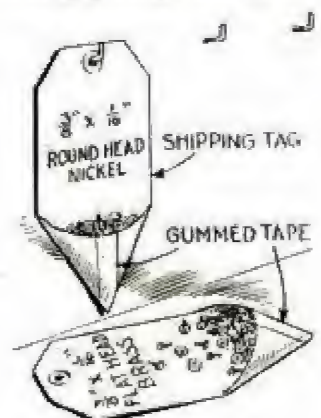
*This flagpole sling supports you in a standing position and leaves both hands free*

With a safety belt and this simple rope sling you not only stand in a comfortable position for work, but you can "walk" up and down the pole easily. The loops of rope snub about the pole at points above and below your waist as shown. To ascend, shift your weight to the left foot and slide the right loop upward with the hand. Then shift your weight to the right foot and move the loop supporting the left foot the same distance upward. To descend the pole, you simply reverse the process.

—Clifford B. Paul, Moline, Ill.

## "Bins" for Screws and Small Parts Formed from Shipping Tags

Shipping tags folded as shown and hung on a wall or bench provide handy storage "bins" for tiny screws, nuts, etc., used in repairing radios and clocks. The size and kind of parts are written on each tag.





## "Drain Finishing" Small Articles Saves Time and Labor



*"Drain finishing" of small duplicate parts leaves a uniform paint film on flat and irregular surfaces*

By a simple system which reverses the usual procedure of dip finishing, you can speed up production painting of a large number of duplicate units. The process makes use of two tanks, one on a sturdy stand which is just high enough to allow the second tank to stand directly underneath as shown. The tanks may be of any convenient size or shape. Articles to be painted are arranged on racks which are lowered into the solution in the first tank. Then the faucet is opened and the solution allowed to drain slowly into the second tank. Steady lowering of the paint level leaves a smooth, unbroken finish on the work.—Geo. O. Trier, Park Ridge, Ill.

## Split Link for Repairing Chain Closed with Monkey Wrench



When inserting a split link to repair a chain, it can be closed snugly with a monkey wrench. The link is clamped in the vise as indicated and is given a slight twist with the monkey

wrench or any other tool with which you can grip the link.

—Victor Albrecht, Forestburg, Alta., Can.

## 'Cellophane' Given Ground-Glass Finish to Diffuse Light

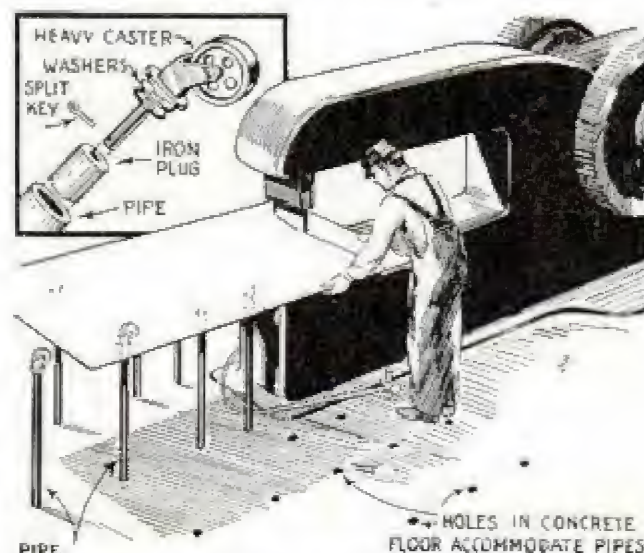
Cellophane given a ground-glass finish and used in a photo lamp or enlarger to diffuse light, will be found more efficient than a ground glass as it is much thinner and will pass about three times as much light as a glass. The surface of the Cellophane



can be given the finish by rubbing each side two ways with fine steel wool.

## Castors Support Heavy Plates at Power Shears

Lengths of pipe fitted with casters and set into holes in the floor about the machine make a one-man job of handling heavy metal plates at the shear. The pipes should be of equal length and the casters of a uniform size so that the work is supported level and at the proper height to be fed through the machine. Holes in the concrete floor should be arranged to suit the varying sizes of work likely to be handled.—T. L. Moore, Detroit, Mich.



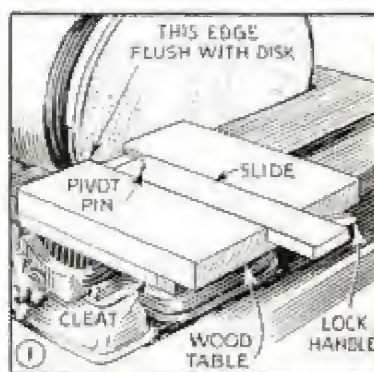
*These inverted casters eliminate the hard work when shearing heavy metal plates*



# Pivot JIG for disk sander

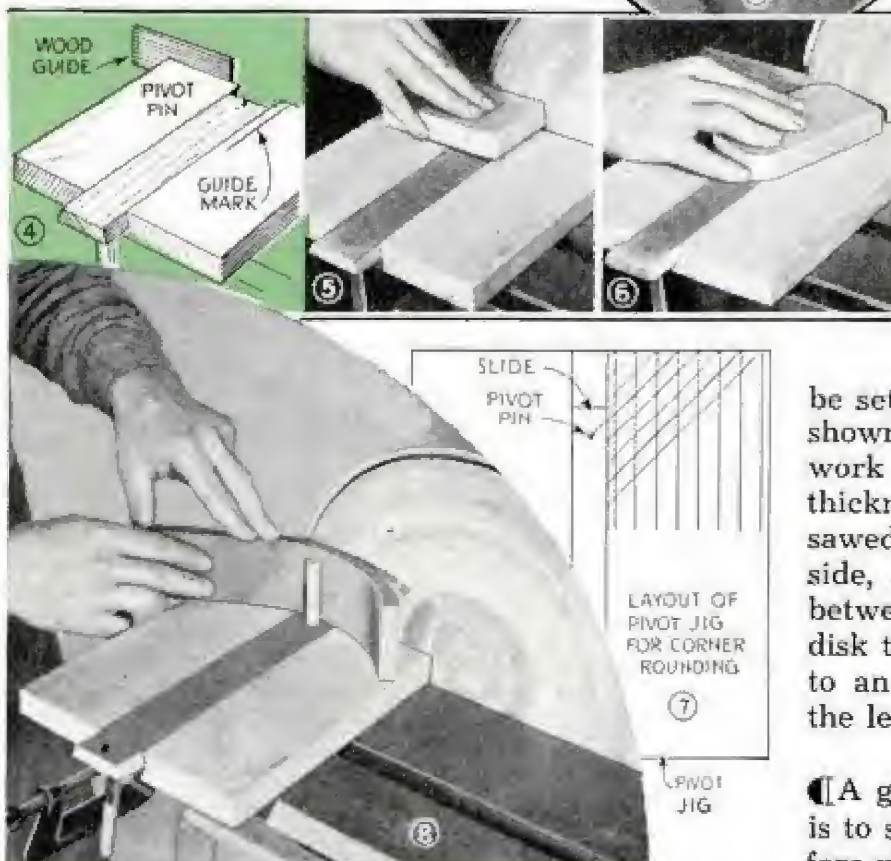
OF THE many types of pivot jigs to aid in sanding work, the one shown in Figs. 1 and 2 is probably the simplest and most practical. It consists of a wood table of a size proportional to the size of the sander table. A dovetail groove is cut in the center on a circular saw by tilting the table about 30°. While the saw table is tilted, a slide should be cut to fit snugly inside the groove. It is advisable to make three or four slides so that each one can be fitted with a different style of pivot point to suit various work.

A feature of the jig is the lock handle, Fig. 3, which, when pushed down, locks the slide securely. Figs. 4 to 6 show how the jig is used for rounding corners. A wood guide is nailed to the edge of the jig table, as shown in Fig. 4, after which the slide is locked at the required radius. A pencil



mark is made on the table, the mark being the same distance from the pivot pin as the latter is from the face of the disk. The work is pressed onto the pivot, one edge being alined against the face of the disk and the wood guide, while the other end is set even with the pencil mark. If desired, the jig table can be pencil-marked as shown in Fig. 7. The angle line intersected by the pivot pin locates the guide line to which the work should

be set. Another use for the jig is shown in Fig. 8, where curved work is being sanded to exact thickness. The work is first hand-sawed and smoothed on the inner side, after which it is advanced between the pivot pin and sander disk to emerge smoothly surfaced to an even thickness throughout the length.



Ⓐ A good way to start a rose slip is to stick the end in a potato before planting.



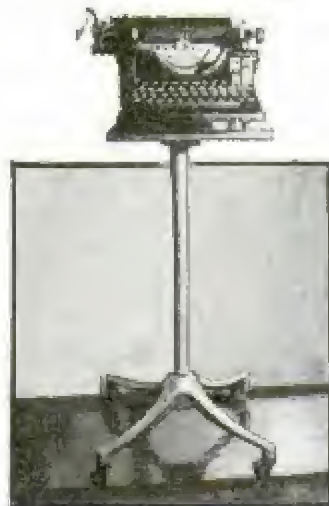
## Window Has an Overhead Spray to Simplify Washing



*No need to carry a bucket of water for window washing when you have this sprayer system*

Saving in time alone will pay quickly for this installation. It consists essentially of two lengths of  $\frac{1}{2}$ -in. pipe connected to the water supply through a wheel valve. A row of  $\frac{3}{16}$ -in. holes, spaced about 2 in. apart, is drilled through one wall of the horizontal section of pipe, the combined spacing of the holes being only about 4 in. less than the width of the glass. When assembled as shown, the horizontal pipe is turned so that sprays of water strike the glass at an angle of about 45 degrees.

## Homemade Typewriter Stand from Junk Parts



As most tables and desks in the home are too high to support a typewriter at the right height, look around in your attic, basement or storeroom for some discarded article that has a base similar to the stand shown. Old organ and piano

stools and similar articles offer possibilities, and all you have to do is fit them with a standard to support the typewriter. The stand in the photo was assembled from the base of an old health lamp, which was cut off at the proper height. The upper part of the stand is a 12 by 14-in. board having the footplate of an old tire pump screwed to the underside so that the barrel or cylinder of the pump can be inserted inside the lamp standard. A short piece of pipe and a floor flange can be screwed to the board to serve the same purpose.

—Norval Burch, Chicago.

## Memo Paper on Night Stick to Take Notes Quickly

One police officer carries a memo paper on his night stick so that it is always ready for instantly making notations. The paper is wrapped around the handle and is held in place with a cylindrical piece of brass.

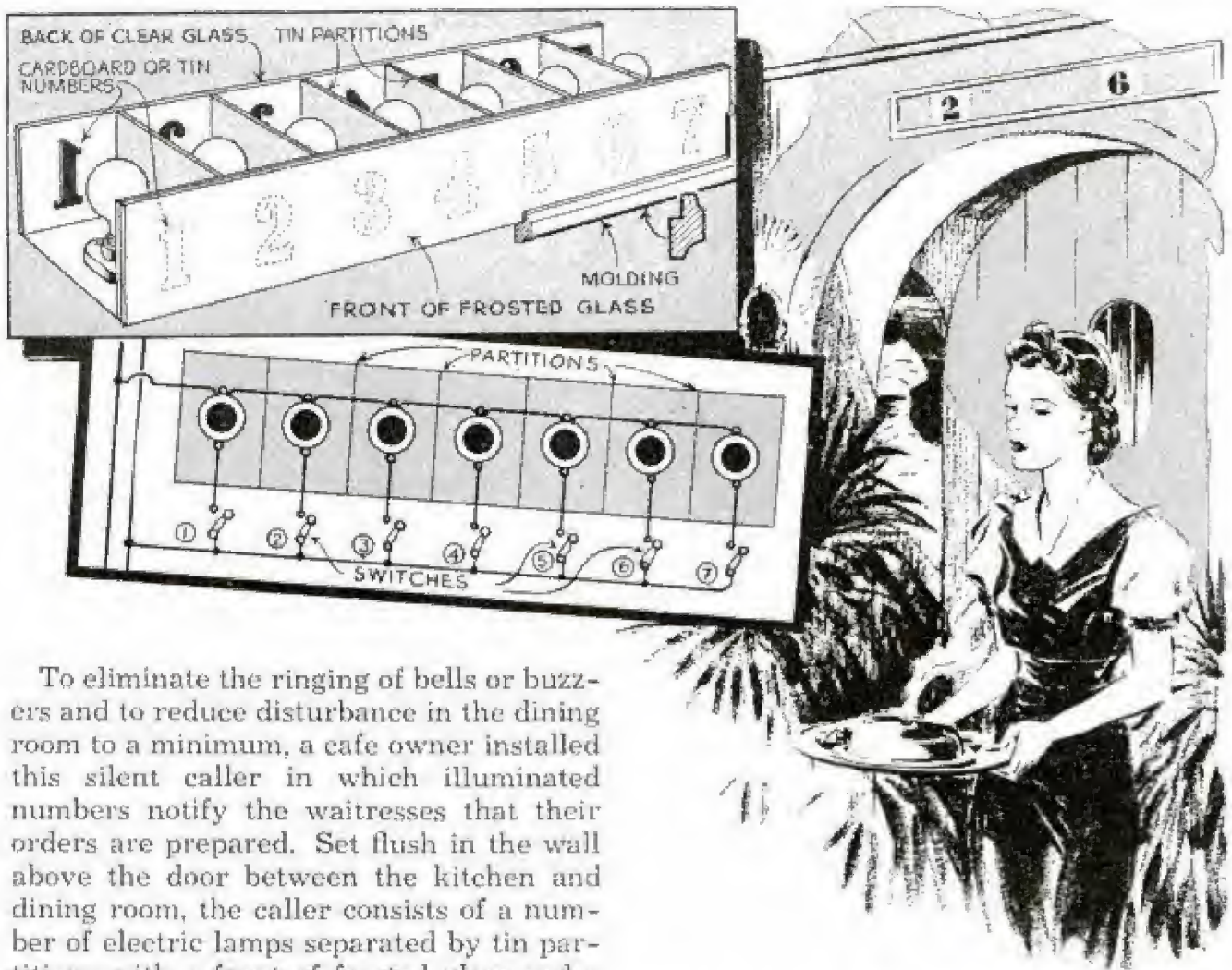


*Memo paper on handle of night stick is covered with brass cylinder, which has opening for writing*

This has a window cut in it to expose the paper for writing, and is moved around the stick as the paper under the window is covered with notes. Several paper sheets can be rolled on the stick at one time, assuring a supply for the day's work.



# Waitresses Called Silently in Dining Room



To eliminate the ringing of bells or buzzers and to reduce disturbance in the dining room to a minimum, a cafe owner installed this silent caller in which illuminated numbers notify the waitresses that their orders are prepared. Set flush in the wall above the door between the kitchen and dining room, the caller consists of a number of electric lamps separated by tin partitions with a front of frosted glass and a back of clear glass. Opaque numbers are cemented to the inside surfaces of both pieces of glass, and the lamps are controlled individually by switches located near the chef, the wiring being done as indicated in the lower detail. When a switch

is pushed, the lamp illuminates its particular compartment so that the number appears black against the frosted glass. The clear glass with its numbers showing in the kitchen serves as a check for the chef.

—Don W. Sigler, Lincoln, Nebr.

## Angle Adjustment on One End of Spirit Level Saves Time

In construction work, where a spirit level is used in determining the slope of certain surfaces, positive adjustment is obtained by slotting the butt plate of the level as indicated and attaching it with two screws. These are loosened to drop the plate to the desired position and then tightened to hold it. Marks may be made on the plate to correspond with an indicating point on the wood to aid in adjusting the level to predetermined degrees.

❶ A lump of dry starch rubbed over grease spots on wallpaper will usually absorb the grease, after which the starch is removed.





## Auto Casing Relieves Arm Strain When Carrying Buckets

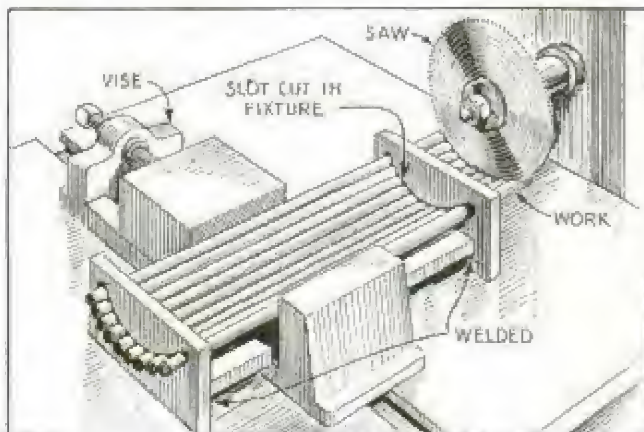


*Piece of auto casing under armpit when carrying heavy load helps to reduce tension on arm muscles*

Engaged in carrying heavy pails of hot asphalt on a highway repair job, a workman found that he could reduce the strain on his muscles by fitting a section of auto casing under his arm to serve as a resilient cushion. This served to hold the pail away from his body without constant tension of the upper-arm muscles.

## Iron Bars Sawed Simultaneously with This Fixture

Unlike many other bar-sawing fixtures for milling machines, this one holds the bars or rods so that they are all sawed off at one time. The fixture consists of three



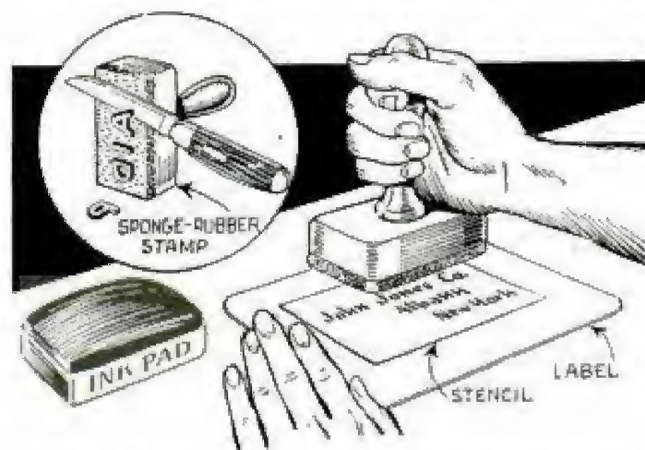
*This fixture holds a number of iron bars at the same curve as the radius of the saw*

pieces of steel plate welded together as indicated, slots to take the work being cut in the endpieces at the same radius as the saw. The width of the base must be the same as the distance horizontally between the ends of the slots. This permits the milling-machine vise to grip the base in which the fixture is clamped and also the bars so that they will be held rigidly.

—H. Moore, Leeds, England.

## Rubber Stamp Replaces Brush for Tag Stencils

To avoid the mess and inconvenience of employing a brush and ink to address shipping tags, labels, etc., with small stencils, one shipping clerk designed a stamp



*Rubber stamp with type removed applies ink from pad to stencil when addressing shipping tags*

which could be inked from a pad. A discarded rubber stamp, with the type shaved off, provides the blank with which the ink is applied over the stencil.

## Rubber Insert in Jigsaw Table Reduces Noise of Vibration

Workmen who dislike the noise caused by vibration when sawing small pieces of metal on a jigsaw, can reduce it considerably by substituting a rubber insert for the metal one in the saw table. A rubber heel is good





for this purpose when the underside is trimmed to fit snugly in the insert hole. The untrimmed upper part of the heel rests on the table and provides a noise-deadening pad on which to rest the work.

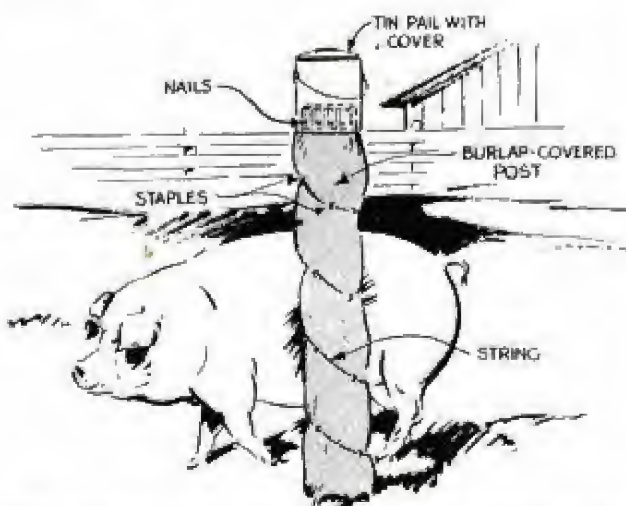
### Price Tickets Laid on Sandpaper Are Lettered Rapidly

When lettering a number of price tickets, showcard writers will find that they can hold the cards down without undue strain on the hand by laying them on a sheet of fine-grain sandpaper, which has been tacked to the drawing board with the abrasive side up. A piece of rubber having the exposed surface roughened slightly will serve the same purpose if sandpaper isn't at hand.



### Automatic Hog Oiler Improvised from Post and Burlap

To provide an inexpensive oiler for his hogs, one farmer drove a post into the ground, wrapped it with burlap and then forced a bottomless pail down over the burlap, nailing it firmly to the post. The pail served as a reservoir for the oil, and the burlap acted as a wick to absorb and apply the oil as the pigs rubbed against it. Once the burlap is saturated, the flow of oil will be gradual.



Oil slowly seeping down the burlap-covered post is applied to hogs when they rub against it

### Glass-Paneled Sign Displays Vegetable "Specials"



This sidewalk sign names the price and displays the goods for the customer

Specially priced grocery items will move faster if you display them attractively along with the price tag. One good way to do this is shown in the illustration—a triangular-shaped sign open at the back and fitted with shelves and glass panels on which the cost of the items can be lettered. The display is equally effective inside the store or outside on the sidewalk.

### Belt Ends Roughened for Cement with Tracing Wheel

Workmen who often have leather belts to splice, will find that a dress-maker's tracing wheel is handy for roughening the beveled ends that are to be lapped and cemented. The wheel makes hundreds of tiny impressions in the surface of the leather, which allows the cement to get a good grip on the joined surfaces.



❖ If a wire brush to clean a file is not available, rub the end of a piece of soft pine over it in the same way a brush is used.



# STAINLESS STEEL



By C. A. CROWLEY

**ALTHOUGH** it is quite generally believed that stainless steel cannot be soldered, brazed or welded readily, proper technique renders these operations easy and the results highly satisfactory. No special equipment is necessary to perform these operations. Slight but important alterations in the usual technique as applied to ordinary metals will insure excellent joints on all kinds of stainless steels.

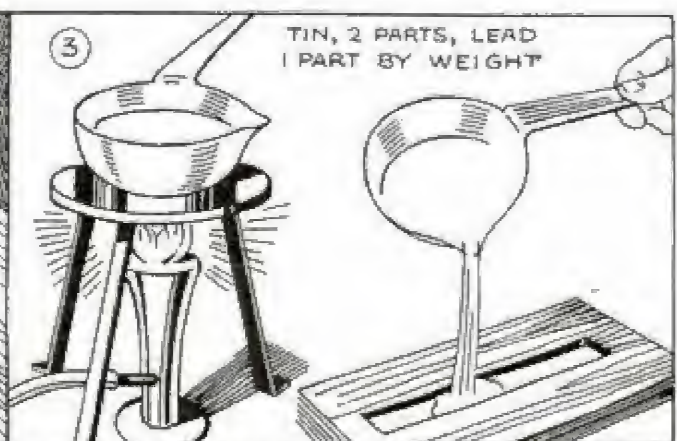
**Soldering:** Stainless steel can be soldered with ordinary soft solder if a few

precautions are taken. The flux used must be rather strong. Hydrochloric (muriatic) acid is excellent. There are also several special fluxes on the market designed especially for use on stainless steel. The flux must be brushed on as shown in Fig. 2, so that it will not spread beyond the area to be soldered. Stainless steel is a poor conductor of heat; therefore, in order to get the work heated to the proper soldering temperature, it is necessary to use a large soldering iron and to apply heat to the work for a longer time than when soldering ordinary steel. This does not mean that the iron is to be heated to a higher temperature than for ordinary work, as excessive heat will discolor the steel and may also cause warping or buckling because of the high rate of thermal expansion of these alloy steels.

After the work has been clamped in position and the flux brushed on, the solder is applied in the usual manner, using a large, well tinned iron as shown in Fig. 1. Ordinary 50-50 solder is satisfactory, but better results are obtained by using a solder having a higher tin content, such as 60 per cent tin and 40 per cent lead or 70 per cent tin and 30 per cent lead. If you are making your own solder, use tin, 2 parts, and lead, 1 part by weight. This is about the composition of the alloy called tinman's solder and is excellent for stainless steel. Soft solder can be cast in a wood form as in Fig. 3. After the soldered joint has cooled, it should be washed well with a solution of washing soda,  $\frac{3}{4}$  to 1 lb., and soap,



FLUX IS BRUSHED ON



SOFT SOLDER CAN BE CAST IN WOOD FORM

see June 1940.



# Soldered, Brazed and Welded

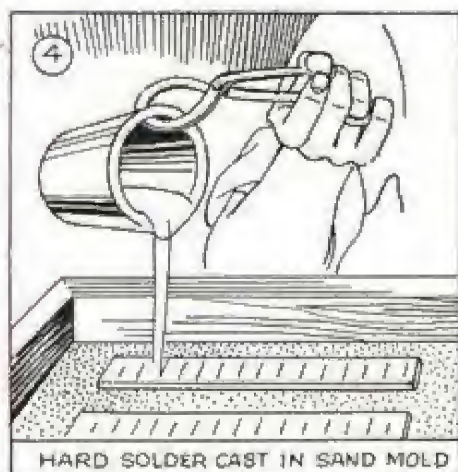
in water 1 gal., as shown in Fig. 7. This solution will remove any excess of the corrosive acid flux and prevent dulling of the stainless steel.

**Brazing:** Precautions similar to those involved in soldering stainless steels must be observed in brazing these metals. The work must not be heated to a higher temperature than is necessary, because of the rate of expansion of stainless steel under the influence of heat. Borax may be used as the flux. Good results can be obtained by using ordinary 70-30 brass as the brazing material. A special hard solder for stainless steel is made by melting together manganese, 20 parts, copper, 25 parts, nickel, 5 parts, silver, 49 parts, and gold, 1 part. Silver solder is made by alloying together silver, 2 oz. to 7 oz., copper, 5 oz. to 2 oz., and zinc to make a total of 10 oz. Both formulas are given in Fig. 5. The silver is first melted in a crucible as shown in Fig. 6, then the copper is added and the heat withdrawn. The mixture is then cooled almost to the solidification point before adding the zinc. The finished alloy is cast into bars or rods for use in a sand mold as shown in Fig. 4. There are also available on the market a number of special hard solders which work exceptionally well.

The parts to be brazed must be cleaned thoroughly, and for good results must be fitted closely. The brazing alloy should not be used as a filling material on a loose joint. This is not only wasteful, especially with a silver alloy, but the joint formed



will not be strong. Lap joints are to be preferred to butt joints or fillet joints. The flux, borax in water, should be brushed on to all the surfaces being brazed and also on to the brazing metal itself. Brushing insures the thorough wetting of the surface with the flux and therefore prevents oxidation or corrosion. The work must be preheated thoroughly with the torch



HARD SOLDER CAST IN SAND MOLD

HARD SOLDER		
MANGANESE	-----20	PARTS
COPPER	-----25	PARTS
NICKEL	-----5	PARTS
SILVER	-----49	PARTS
GOLD	-----1	PART
SILVER SOLDER (5)		
SILVER	-----2 TO 7 OZ.	
COPPER	-----5 TO 2 OZ.	
ZINC ADDED TO GIVE TOTAL OF 10 OZ.		

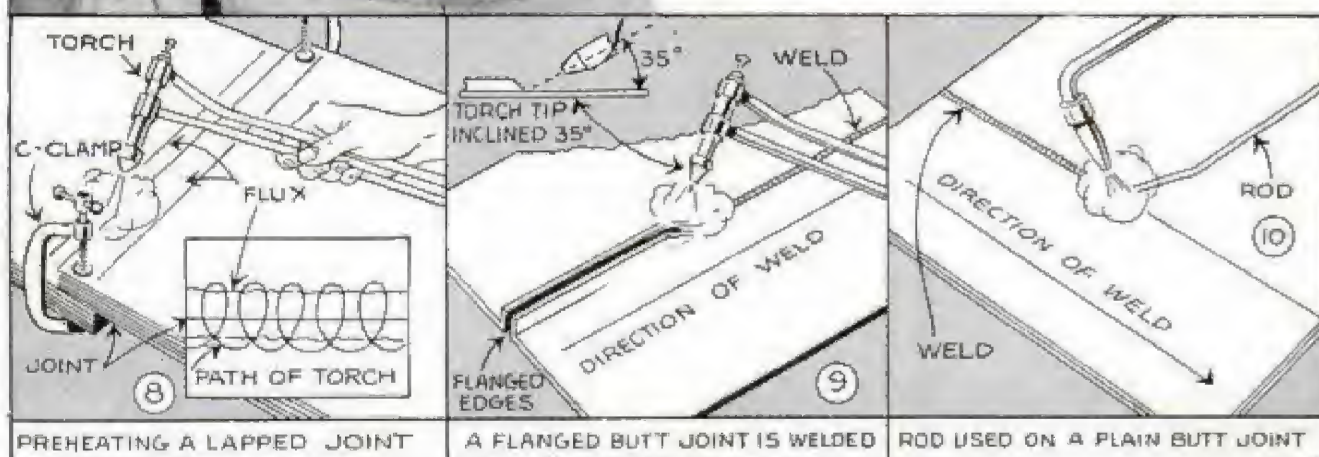






ing and polishing, or by pickling in a solution consisting of nitric acid 20 to 30 per cent, in water. The pickling solution should be used at a temperature of 125-145° F. Detailed directions for finishing will be given later in connection with welding, since the problem is the same.

**Welding:** Stainless steel is well adapted to welding, and if its characteristics are taken into consideration good results can be obtained. Before any kind of welding can be carried out, it is absolutely necessary that the surface of the metal to be welded be cleaned and free from grease, rust or scale. Cleaning is accomplished by grinding, pickling or sandblasting. A pickling solution for stainless steel as shown in the detail above Fig. 11, is made by slowly adding sulphuric acid, 1 lb., to cold water, 1 gal., in a stoneware crock, and dissolving in this dilute acid, common salt, 1 lb. This solution is heated to 180° F. on a water bath as shown in Fig. 14, and the work is



not only directly on the joint, but also on the surrounding metal. The proper method is shown in Fig. 8. If the parts are of unequal thickness or of different metals, the thicker part or the one which is the better conductor of heat should be heated more than the other. When the work has been heated to the melting point of the hard solder or spelter to be used, apply it to the hot work and permit it to melt and flow into the joint. While applying the solder, the torch must be kept in motion, as in preheating, without permitting the flame to concentrate and overheat sections of the work.

Because of the higher temperatures necessary in brazing, discoloring of the stainless steel hardly can be avoided. Discoloration can, however, be removed by grind-

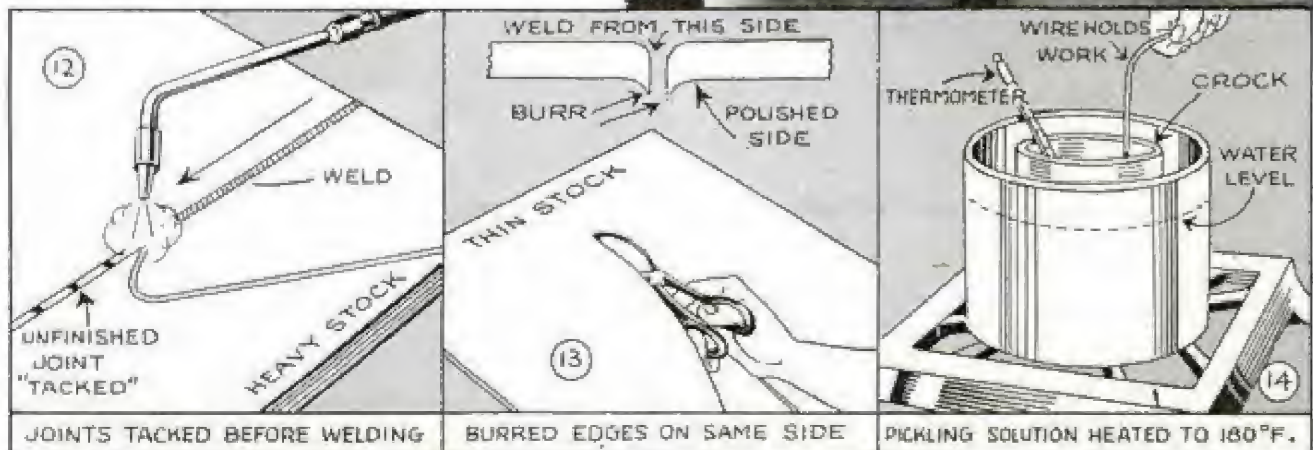
dipped into the hot solution. After pickling, the work must be rinsed thoroughly in hot and then cold running water.

When stainless steel is sheared, there is always a deformation at the cut edge, the top edge being rounded off and a burr being left on the bottom edge. In butt welding, it is desirable to have this burr on the polished side, or the side that is to be finished. This is indicated in magnified form in Fig. 13. Then the weld is made from the opposite side, and in finishing it is only necessary to grind off the burr and polish the joint. The rough surface of the weld itself does not have to be ground and polished. The work is held in place most readily by "tacking."

**Spot Welding:** Stainless steel is easily spot welded because its surface makes good

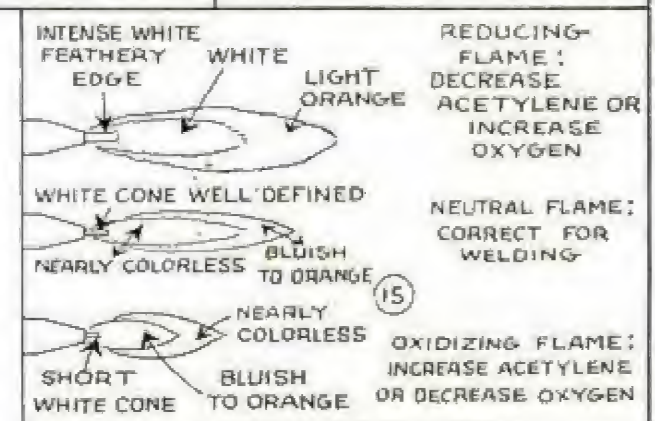


contact with electrodes, has a lower melting point than ordinary steel and, further, because of its high electric resistance which makes for quick heating. The method of spot welding stainless steel is the same as for ordinary steel, and the same equipment can be used. Successful spot welding depends on careful adjustment and control of current, the time of flow, diameter of the electrode contact points, and applied pressure during the weld. The diameter of the electrode contact points is governed by the thickness of the metal being welded; for heavier gauge metal large points must be used. Pressure must be governed largely by experience. Too great a pressure lowers the resistance and therefore the heat which is produced. Excess pressure also has the undesirable effect of indenting the surface of the weld. As for current and



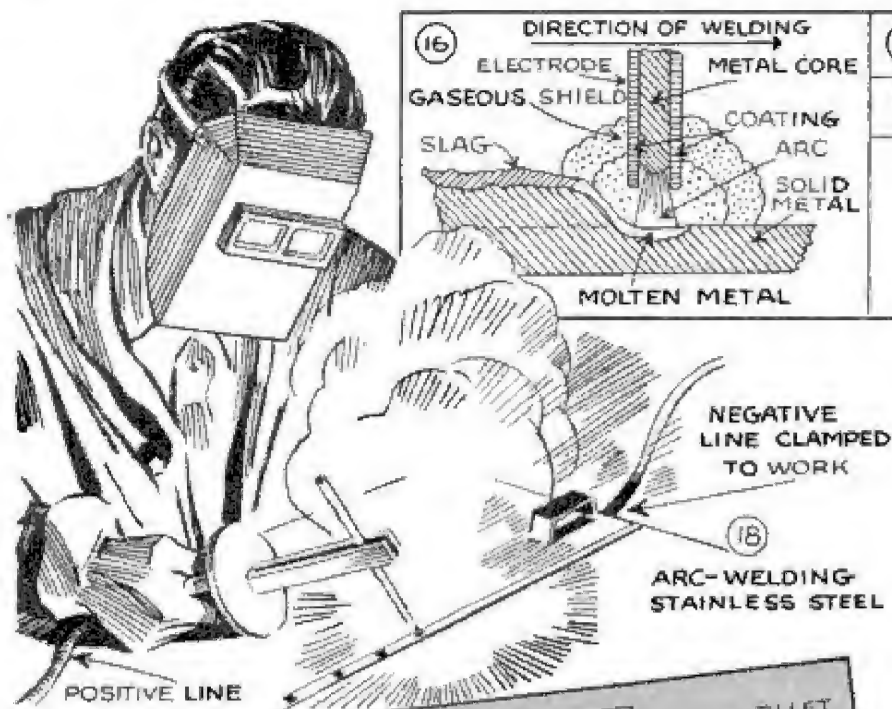
time of flow, it is desirable to use a heavy current flow for a short time, rather than smaller current for a longer period of time. With corresponding currents, the time for spot welding will be shorter for stainless steel than for ordinary steel. The best method is to make sample welds on scrap pieces of stainless steel, and adjust current, time and pressure to give strong welds. A spot weld in stainless steel should be strong enough to be twisted 80° before shearing through. Fig. 20 illustrates this and other methods of testing welds. It is particularly recommended that test welds be made before starting a job and that the experience thus gained be applied to the job. This will insure good results and save a considerable amount of time and expense.

**Gas Welding:** Stainless steels fall into

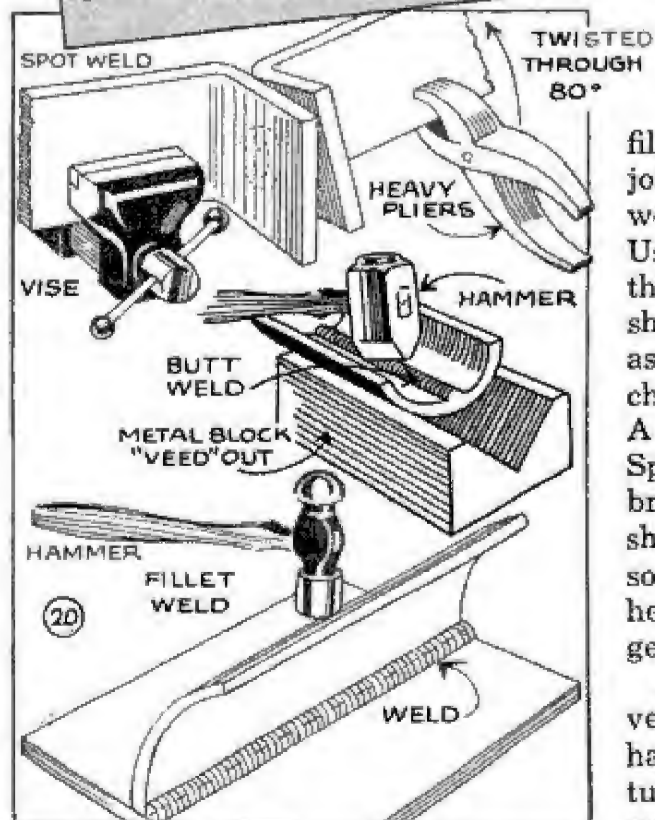
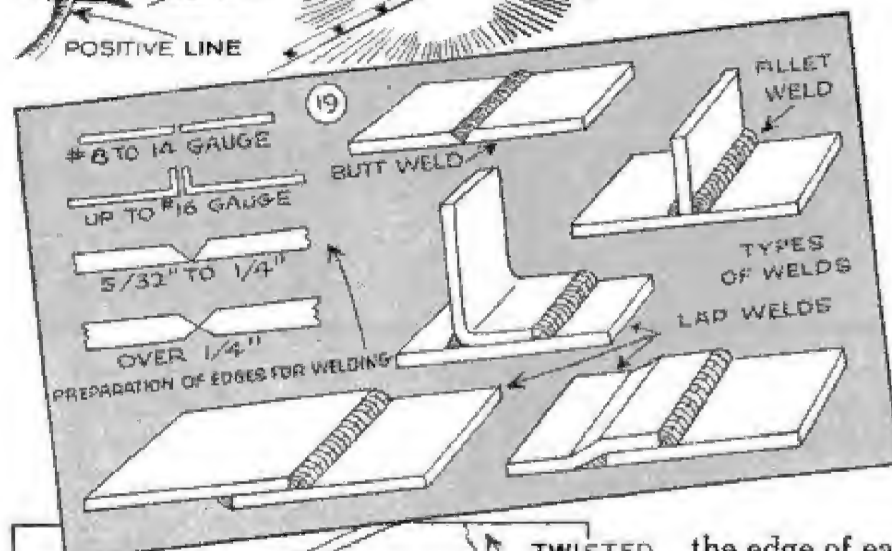


two main classes, those that contain both chromium and nickel, generally from 8 to 25 per cent of chromium and 7 to 22 per cent of nickel, and those that contain chromium only, usually about 12 to 18 per cent. The most common varieties are those known as "18-8" (18 per cent chromium, 8





17 ARC-WELDING CURRENT FOR STAINLESS STEEL	
ELECTRODE DIAMETER	CURRENT AMPERES
3/32"	50-75
1/8"	75-100
5/32"	110-140
3/16"	150-175
1/4"	175-200



per cent nickel) and "17" (17 per cent chromium) stainless steels. These are also sold under many trade names, but can be identified by these numbers, which refer to their composition. The composition of the stainless steel being used is important as the characteristics of these two groups differ widely, and they must be handled differently in welding, and especially after welding. In either case, the welding rod used must be approximately the same composition as the parent metal. On light sheet metal, less than No. 16 gauge, a flange of about  $\frac{1}{8}$  in. should be raised on

the edge of each piece to be joined. During welding operation this will be melted down, as shown in Fig. 9, and the use of a filler rod is avoided. Various other types of joints are shown in Fig. 19. On heavier gauge work, it will be necessary to use a filler rod. Use a rod of about the same composition and thickness as the parent metal. The flow of gas should be adjusted to give a neutral flame, so as to prevent oxidation of the metal. Various characteristic flames are indicated in Fig. 15. A very slight excess of acetylene is desirable. Special "cromaloy" welding flux may be brushed on the parts being welded. The flame should be directed toward the unwelded part so as to preheat the work as in Fig. 10. On heavy stock the joints should be "tacked" together as illustrated in Fig. 12.

**Arc-Welding:** Some stainless steels have a very high coefficient of expansion, and hence have a tendency to warp under high temperature necessary in welding. For this reason, speed in welding is desirable to reduce this effect to the minimum. Arc welding, therefore, is



to be preferred to gas welding on stainless steel because of the greater speed of operation possible; but with care gas welding will give good results.

Metallic electrodes for use in arc welding stainless steel should have approximately the same composition as the metal being welded. Coated electrodes as shown in Fig. 16, are essential. There are special electrodes made by reliable manufacturers especially for use on stainless steel and these must be used for satisfactory results. The diameter of the electrode depends on the thickness of the metal being welded, and should be approximately the same as the thickness of the metal. Stainless steel is always welded with reverse polarity as shown in Fig. 18; that is, the work is made negative and the electrode positive, which is just the opposite of the procedure ordinarily used for welding common steels. Smaller currents are used on stainless steel than on ordinary steel. The current values recommended for ordinary welding will be found in Fig. 17.

**Treatment after Welding:** Stainless steels containing nickel as well as chromium will require no heat treatment after welding, as the weld is soft and ductile. Stainless steels without nickel, however, must be annealed by heating to 1,200-1,300° F. in an oven for half an hour, and permitted to cool slowly.

The scale and oxide film on the welded metal must be removed by grinding or pickling. The burr which was left after cutting the metal, can be ground off, and the surface polished. Polishes used on stainless steel must not contain iron. Use aluminum oxide grits for polishing, for example Nos. 80, 100 and 120. The articles may be buffed on a rag wheel at very high speed. Throughout the polishing process, care must be taken to avoid overheating and consequent burning of the work.

**Establishing Resistance to Corrosion:** Maximum corrosion resistance on the polished metal is developed by immersing the article in a solution of nitric acid, 3 parts by volume, in water, 7 parts by volume. The acid is added to the water in a stone-ware crock. The solution is heated to 140° F. and the work is dipped into the solution for 20 min. or more. It is rinsed thoroughly in hot and then in cold running water and dried. For highly polished pieces, the last polishing operation is repeated.

## Colored Overlay on Job Press Speeds Up Feeding

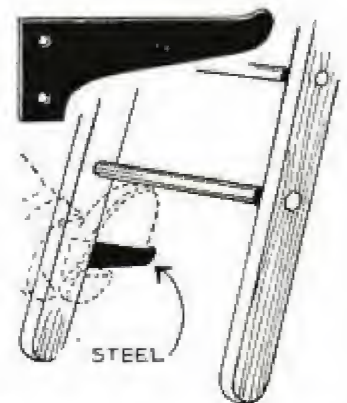


*Printer's eyes follow colored area on tympan, and hand accordingly directs paper to guides*

A Wisconsin printer claims that high speed can be attained in feeding paper in a platen press if a sheet of brightly colored paper, the same size as the stock being printed, is glued onto the tympan or impression sheet. The eyes of the press feeder follow the color area easily and the hand accordingly directs the paper to the guides accurately.

## Foot Scraper on Painter's Ladder to Keep Mud off Rounds

While engaged on an outside painting job, the foreman of a crew of workmen noticed that mud tracked on the ladder rounds made them so slippery that there was danger of an accident. To avoid



this, he had foot scrapers cut out of steel and screwed on to the side of each ladder as indicated, so that the men could clean their shoes before climbing the ladders.



## Lighted Panel Helps Jeweler in Assembling Watches

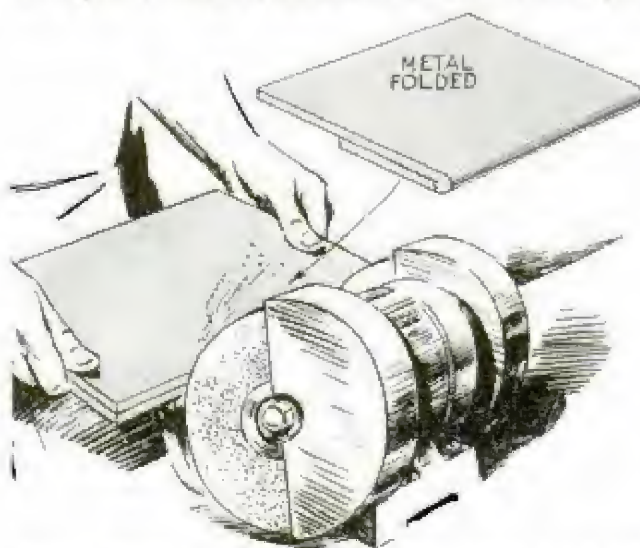


*Intricate parts of models or watches are easily assembled on this lighted ground glass*

One jeweler found that a lighted ground-glass panel set in the top of his repair bench was a help in assembling the intricate mechanism of a watch. By holding the work directly over the lighted portion of the glass individual parts are shown clearly, the diffusion of light by the ground glass eliminating glare and shadows.

## Heavy Sheet Metal Is Cut on Grinding Wheel

I had a piece of sheet metal, which had to be cut in two, but it was too thick to cut with a pair of shears, and it was too much of a job to use a hack saw. To do the job



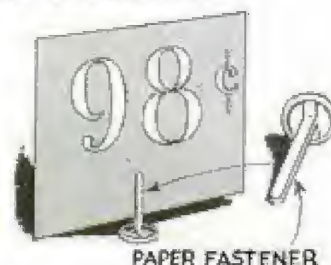
*Heavy sheet metal cut in two by folding work and grinding off edge at the fold*

quickly, I folded the work where it was to be cut in two, and then ground off the edge at the fold. This took only a few minutes and resulted in a neat job.

—Alfred J. Klatt, Philadelphia, Pa.

## Price Tags Neatly Displayed with Paper Fasteners

Small price tags are supported neatly on paper fasteners of the type shown. They are hardly noticeable, and when the tags are slipped between the legs of the fasteners, you can set them on any flat surface.



## Glass Tube Clamped in Vise Is Rubber Protected

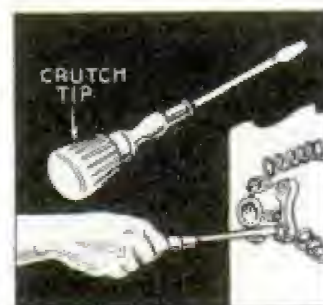


When working with tubes of glass or soft metal, they can be held firmly in a vise without breaking, as indicated. A piece of rubber hose somewhat larger in diameter than the work is slipped over it and is then pinched in the vise jaws.

## Exposed Shank in Screwdriver Insulated by Crutch Tip

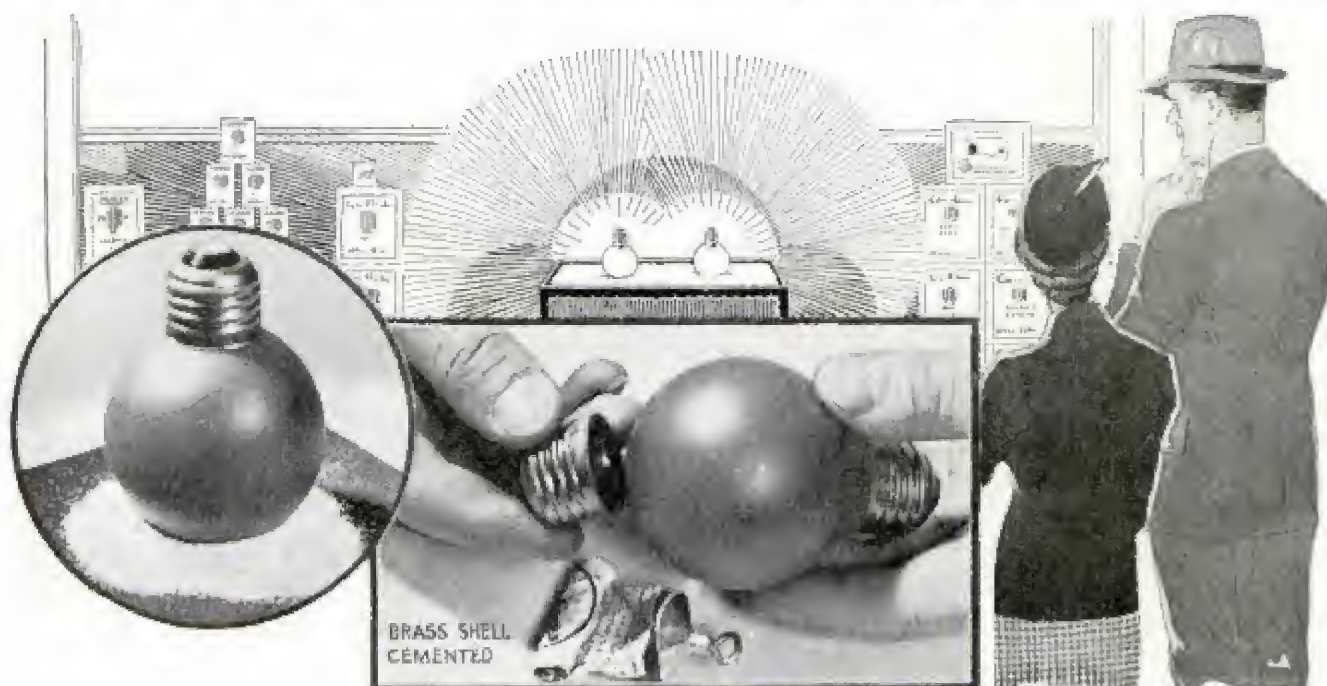
Electricians, auto mechanics and others who frequently use a screwdriver around wires carrying electric current can often avoid accidental shocks by simply slipping a large rubber crutch tip over the end of the handle as indicated. This idea

is particularly intended when using a heavy screwdriver where the shank is exposed at the end of the handle. Besides this, it tends to cushion the palm.





# How Does Current Enter This Electric Bulb?



Setting in a show window, an illuminated electric bulb with its threaded brass shell exposed to view will attract attention and lead to much speculation regarding the source of current supply. The secret is a round bulb on which a false, threaded shell is cemented. This shell is exposed but the real one is imbedded in a

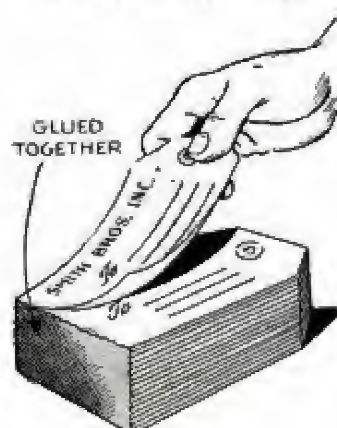
pile of dry sand and is screwed into a socket also concealed. Or, the socket may be eliminated by soldering insulated wires directly to the terminals on the bulb. Care must be taken in attaching the false shell and in concealing the wires to avoid easy detection of the secret.

—Kenneth Murray, Sturgis, Mich.

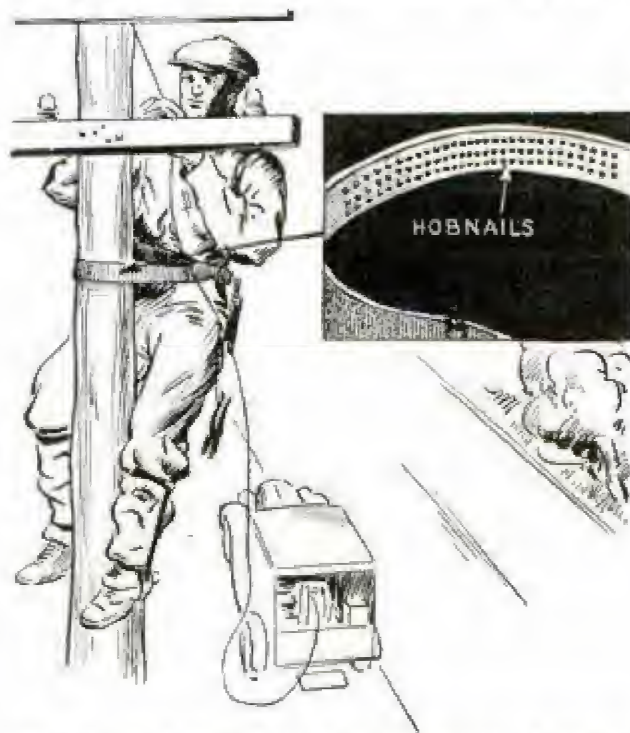
## Hobnails Driven in Lineman's Safety Belt Prevent Slipping

After having a bad fall from a telegraph pole because his safety belt slipped, a lineman improved it with hobnails. These were driven through a portion of the belt so the heads came in contact with the pole. The heads dig into the pole and keep the belt from slipping.

### Shipping Tags in Tablet Form



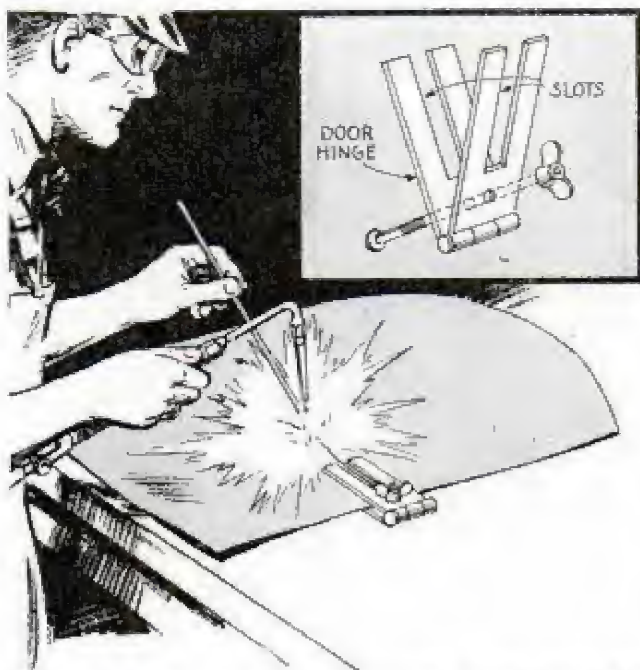
To avoid waste or loss of tags, one shipping clerk has them blocked in tablet form. The additional cost is more than offset by preventing loss or damage when loose tags are thrown in a drawer or left on a desk.



Hobnails projecting from lineman's safety belt contact surface of pole to provide non-slip surface



## Slotted Clamp Holds Thin Metal When Welding

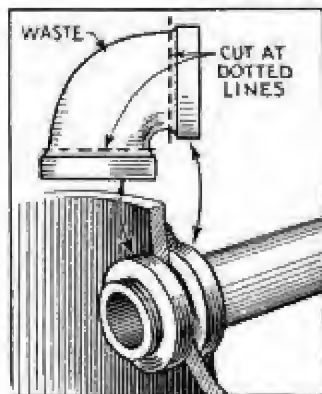


The slotted jaws of this homemade clamp hold thin sheet metal in position for welding

When welding thin sheet metal you need this clamp to hold meeting edges of the work in alignment. It's made from a heavy hinge such as that taken from an auto door. Both leaves of the hinge are slotted as shown, and are curved slightly so that they will grip the work. A stove bolt and wing nut are provided for tightening. When placed on the work, the joint should center between the projections of the jaws so that the meeting edges of metal will be in perfect register.

—A. H. Waychoff, Tempe, Ariz.

## Pipe Connected to Tank by Rings Cut from Elbow



On a job of connecting a pipe to a water tank, where there was no tap available, the work was done with threaded rings. These were obtained by sawing off the ends of a pipe elbow. After screwing one of

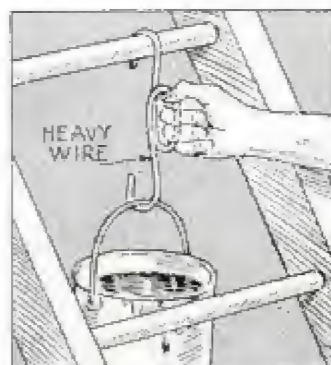
the rings over the pipe on each side of the tank and drawing them tight, molten solder was brushed over the outside ring to

help make the connection watertight and to provide a neat appearance.

—W. C. Wilhite, Carlinville, Ill.

## Paint-Bucket Hook Has Handle

To simplify lifting and carrying his paint bucket, a painter uses a strong wire hook, which has a loop in the center to serve as a handle. When he wants to move the bucket, he just grips the handle and carries the whole assembly to a new location without first removing the bucket and then the hook.



## Customers in Self-Service Store Handle Vegetables with Tongs

Noticing that many of his customers disliked to handle vegetables because they soiled their hands or gloves, the manager of a self-service grocery store provided each vegetable bin with a pair of tongs. These are made by pivoting two wooden spoons together with a small bolt, which is located near the ends of the handles.



Customer uses tongs to pick up vegetables in self-service, to avoid soiling hands or gloves

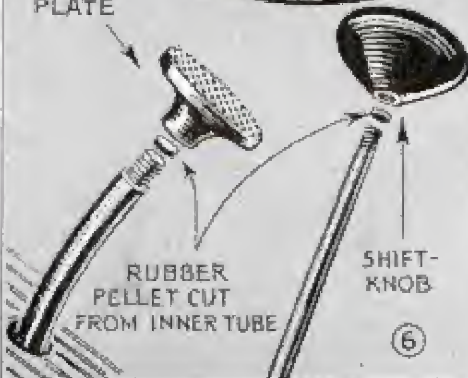
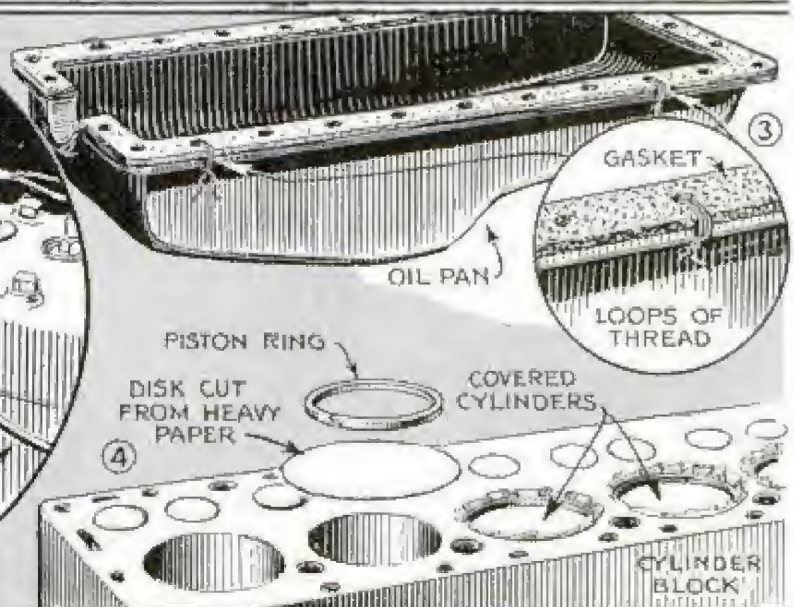
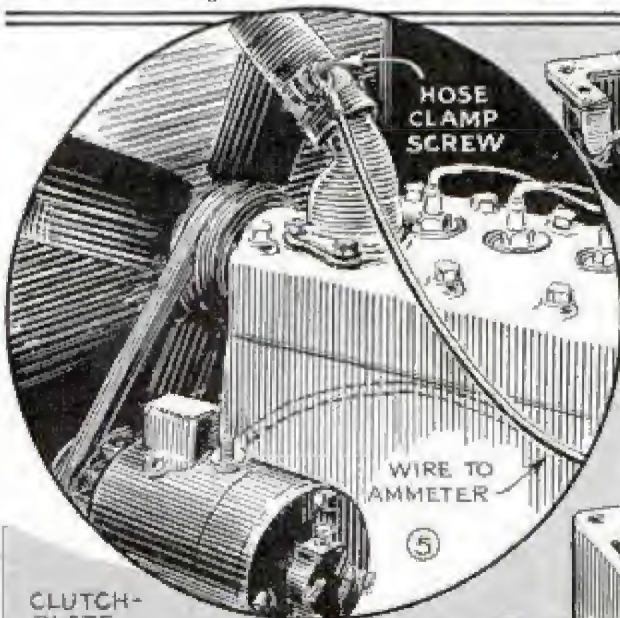




1. Bumperettes bolted over front bumper of tow truck aid in pushing cars. 2. Inverting battery-box clamps makes it easier to remove battery from dash



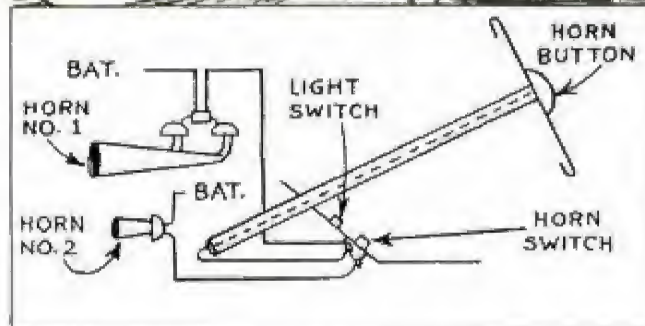
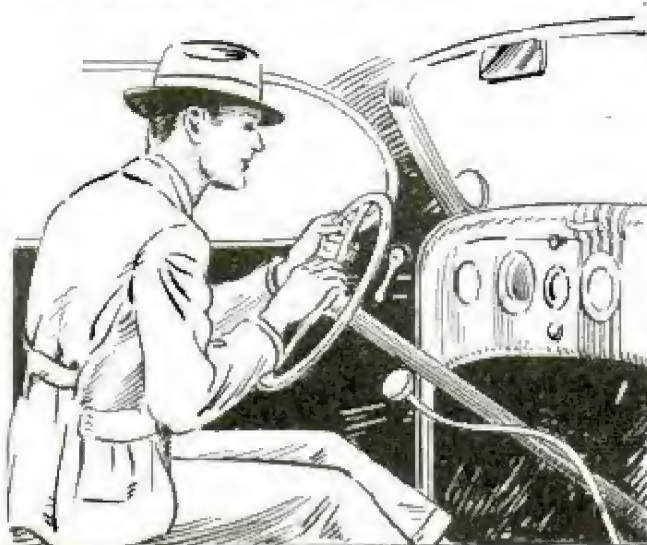
# AUTO SHORTCUTS



3. Tying loops of thread through holes in the gasket and oil pan will prevent the parts shifting while replacing the latter.
4. Before starting a valve job tap an old piston ring into each cylinder over a disk of heavy paper to keep out chips and dust.
5. Instead of taping the "hot" battery-to-ammeter wire just hang the lug terminal on a hose-clamp bolt.
6. Tiny rubber pellets placed under the pedal plates and gear shift knob will prevent these parts loosening.



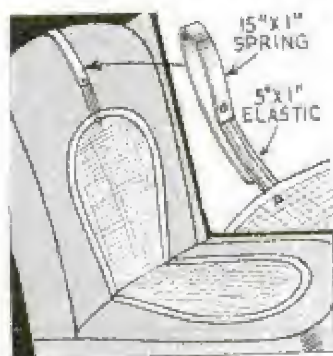
## Auto Horns of Different Tones Controlled by Foot Switch



*A loud horn for country driving or a soft one for city use is cut into the circuit by pressing a foot switch*

Motorists who desire a loud horn for country driving and a soft one for city use, will find the following method of wiring them ideal as it permits either horn to be operated with the horn button by merely pressing a foot switch of the type used to raise or lower the headlight beams. Both horns are wired to the battery or ammeter, and one of the wires leading to the horn button on the steering wheel is connected to the third terminal on the switch.—L. A. Johnson, Omaha, Nebr.

## Hook Keeps Rattan Seat Cover from Tipping Forward

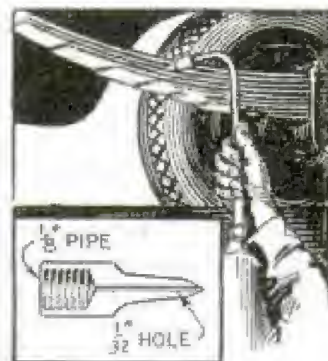


Disliking to hold up the backs of my rattan seat covers when entering the car, I fitted each one with a strip of elastic and a clip to slip over the back of the seat. The clip was

shaped from a piece of clock spring or spring steel, and the elastic link between the clip and cover was used to prevent undue strain on the seat from tearing the top of the cover.—R. F. Gornoll, Chicago.

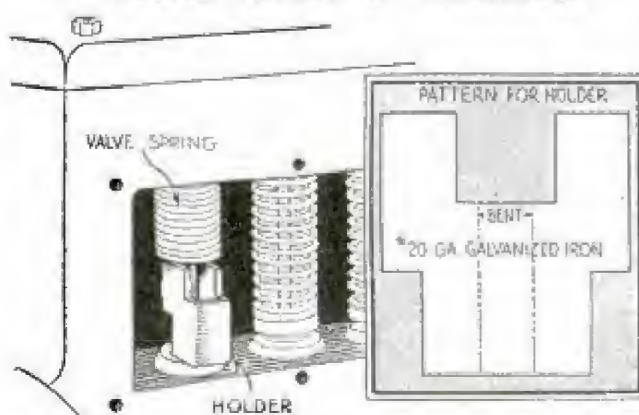
## Fitting to Lubricate Springs with Grease Gun

You can do a good job of lubricating springs with this fitting, which attaches to a grease gun. For uncovered springs, the leaves are spread with a chisel or screwdriver and the grease forced between them. When the springs are covered, small holes are prick-punched in the cover to take the pointed end of the fitting. It is merely an old-type tip from a Zerk gun with the end ground to a point. When used on uncovered springs, it's a good idea to grind the end to a chisel shape. Small pipe or tubing adapters can be made to use it on any gun.



—Arnold Austin, Janesville, Wis.

## Valve-Spring Compressor Works When Motor Is Cranked



*You don't have to squeeze handles or do any twisting or pushing to get this compressor into place*

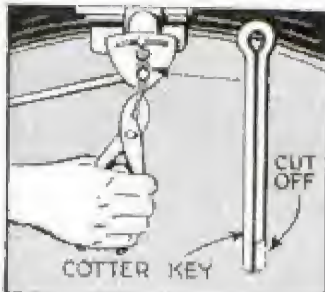
There's no danger of injuring your fingers with this valve-spring compressor or holder, because it won't slip out of place, and you don't have to twist it from side to side or squeeze handles to get it into position. Just crank the motor until the valve is raised as high as it will go, set the compressor under the spring-retaining washer



and then turn the motor enough to release pressure from the tappet. You can now remove the keeper and take out the valve without disturbing the spring.

—A. S. Wurz, Jr., Rockyford, Alta., Can.

## Altered Cotter Key Spreads Easily

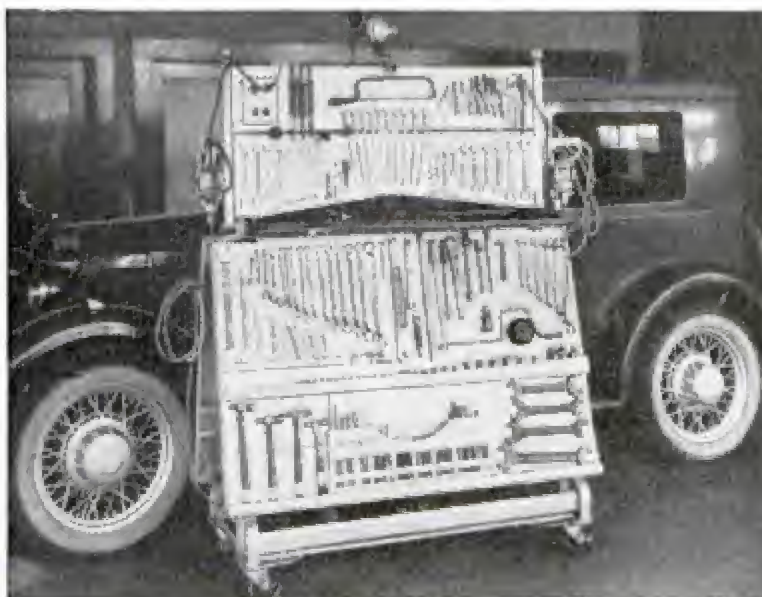


Before inserting a cotter key into a place that is hard to reach, cut off a piece from the end of one of the legs as indicated. You'll find that this makes it easy

to grip the end of the other leg with a pair of pliers to spread the key.

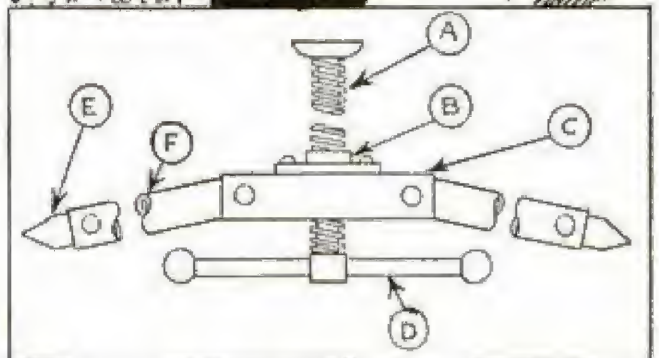
## Portable Tool Rack Has Outlets to Connect Lamps and Drills

A Florida garageman is the owner of this portable tool rack, which keeps the tools close at hand and in plain sight so that they can be selected at a glance. The rack is fitted with electrical outlets for plugging in drills, grinders, extension lamps, etc., and it has a strong spotlight at the extreme top that can be adjusted to throw light on a motor or into a car body. It is fitted with small wheels so that it can be rolled right up to the job at hand, and has a long extension cord, which is plugged into the nearest wall socket.



*This rack brings all your tools to the job at hand where they are in plain sight for rapid selection*

## Changing Transverse Car Springs Easy with This Spreader



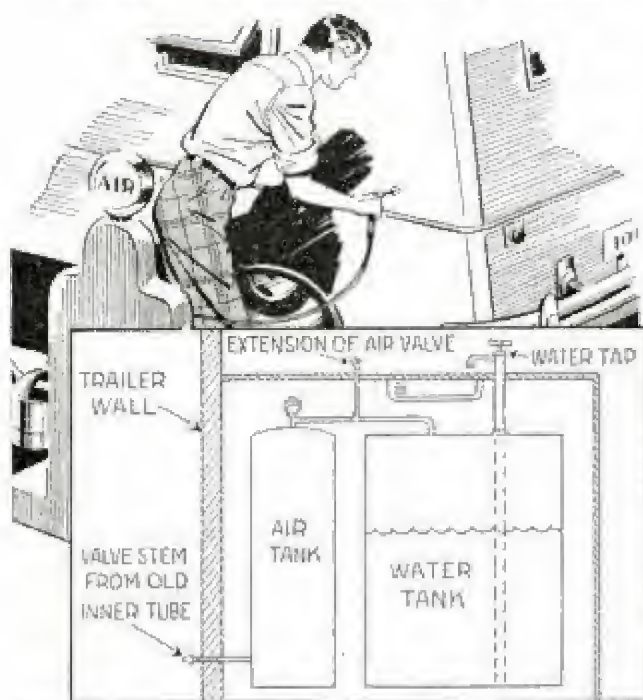
*Ford springs are easily sprung into position to insert the shackle bolts with this spreader*

Ford mechanics will find this spreader just the thing when removing or releasing springs. And it costs very little to assemble as the main part is an old screw jack of the type furnished with Ford cars several years ago. The jack is stripped and the screw A, and the flange B, are used. The flange is bolted to a piece of channel iron, C, which is drilled to let the screw pass through it. Pieces of  $\frac{3}{4}$ -in. pipe, F, are pivoted to the angle iron to serve as arms, which have short lengths of  $\frac{1}{2}$ -in. pipe, E, projecting from the ends. These are ground or flattened to a chisel shape and are held in the ends of the arms by bolts, a series of holes being drilled in the  $\frac{1}{2}$ -in. pipes to permit adjusting the width of the spreader. Brazing a handle, D, to the end of the screw completes the tool.

❏ Never switch on your bright lights when you suddenly run into a fog as the stronger the light is, the more it is reflected into the driver's face.



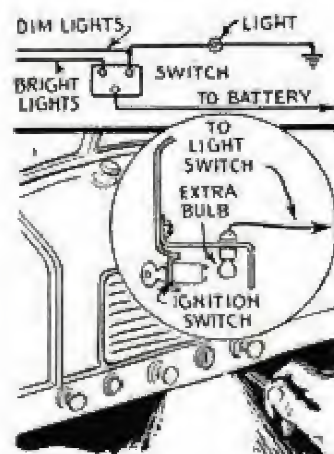
## Pressure for Trailer Water System Comes from Auxiliary Tank



Auxiliary tank in trailer water system stores air to replenish pressure as required

One trailer owner who had a water-pressure system, installed an auxiliary air-storage tank so that he could raise pressure in the water tank by merely turning a valve. The air intake, which was a tire valve soldered to a pipe nipple, projects slightly from the side of the trailer, where it is reached easily with an air hose at a filling station. The valve to control the air supply to the water tank can be located wherever desired. In the original installation, an extension handle from the valve was provided so the pressure could be controlled from inside the trailer

## Extra Lamp on Instrument Panel Illuminates Ignition Switch

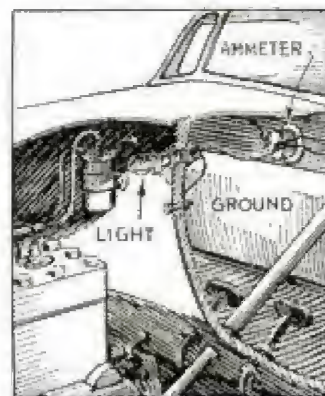


I installed an extra lamp behind the instrument panel of my Chevrolet to illuminate the ignition so that I could see to insert the key at night. The lamp was mounted as indicated in the circular detail, and was wired

into the circuit controlling the dim or parking lights. By connecting the lamp into this circuit, an extra switch was unnecessary, and the lamp was not on while driving.—Edward R. Grogg, Cincinnati, O.

## Motor Illuminated by Lamp Installed under Hood

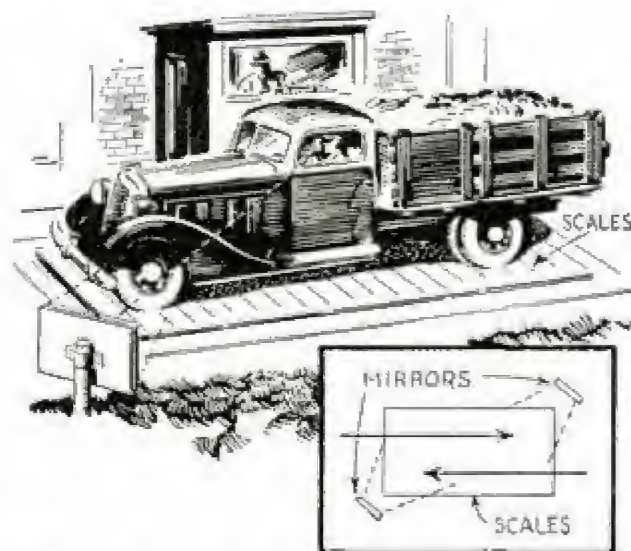
Mounted on the dash under the hood of your car, a switch-type dash lamp will illuminate the motor at night, or serve as an electrical outlet for a trouble light and other accessories. Also, it serves as a



handy receptacle for connecting a home battery charger. One wire from the socket is grounded and the other connected to the ammeter.—A. Amos, Fort Wayne, Ind.

## Mirror Tells Driver When Truck Is on Scale Platform

As some drivers had trouble in determining when all four wheels of a truck were on the scale platform, mirrors were mounted on posts at the corners of the scale as indicated in the detail. The mirrors enabled a driver approaching from either side to see the reflection of the front wheels and the edge of the platform.



A glance in the mirror shows the driver when the front wheels are near the edge of the scale platform



# "TIPTOE-MATIC" CLUTCH IN 1938 CHEVROLETS HAS NEW, EASY-ACTING DIAPHRAGM SPRING



(Above) Units of the "tiptoe-matic" clutch; the diaphragm spring is seen within the assembly at the left.

A single disc-like spring, instead of nine separate coil springs formerly required, is the unique feature of a new type of clutch used in all 1938 Chevrolet cars and trucks.

Besides reducing the number of operating parts, the new design effects smoother engagement and requires less pedal pressure. Although the spring exerts a pressure of 1100 pounds, only 25 pounds' pedal pressure is needed to release the clutch. Because of its easy action, the clutch is called "tiptoe-matic."

The spring is a slightly-dished, slotted diaphragm of spring steel. When the pedal is depressed, eighteen radial tongues formed in the disc act as levers to cause the rim of the disc to recede from contact with the pressure plate, thus releasing the clutch.

Clutch engagement is smoother, because the diaphragm spring applies a more uniform pressure around the circumference of the pressure plate; formerly, pressure was applied at nine separate points by the coil springs.

(Below) When a disc goes through the Magnaflux test, even the slightest crack is revealed.



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# Latest Tricks of the Film Makers

(Continued from page 715)

scale down to plus or minus a thousandth of an inch. Imagine the tedious, nerve-racking task of supplying animations in the single picture of a scene with nine characters in it, as frequently happens when Snow White and the Prince are with the Seven Dwarfs. The drawings first had to be executed on sheets of paper seven and seven-eighths inches by ten inches. Supplying the animation was comparable to writing on the head of a pin. Before the picture was half completed, we had to adjust our standards so that the drawing field could be increased twenty per cent, thus

filmed with a thirty-five-millimeter camera. From this, thirty-five-millimeter negative reduction prints were made with a special wash-off relief emulsion. Here only the emulsion which was exposed remained on the film. This emulsion could be dyed-tinted, then turned over to the painting and inking department for coloring in the usual manner. Thus, we have been able to get fine detail into the drawings that would not be possible otherwise.

In order that you can fully understand the advances that have been made, let me briefly sketch the making of an animated film in color.

Since the "Three Little Pigs" became world-wide box office successes, the story has become the thing in animated film. The old formula of stringing together a few gags is as dead as last month's song hit. So, into a huddle with Walt Disney go writers, an animator or two, the musical director and the sound engineer. They pool their talents in fashioning a story idea. After three or four meetings the animators rough out a few of the principal scenes, while the musical head and effects men make suggestions regarding appropriate music and sound. The drawings then are placed on a large board in front of Walt Disney and his assistants and the story begins to take shape. The finished scenario is broken down into scenes and these are numbered and passed along to the animators together with two sheets. One furnishes him with specific drawing instructions, the other, an "exposure sheet," is a break-down chart of the music and sound effects in a scene, which the animator uses as a guide in his drawing. The reason for this is that the music as well as the dialogue and sound effects are made separately from the cartoon frames and in the final production stage are pieced together by means of a precision mechanical tone beat.

Basically, our film production is simply a mathematical process. Since film is standardized at sixteen frames to the foot and run by projection machines at twenty-four frames per second, it is possible to make these three elements separately and then accurately synchronize them. In the color-

(Continued to page 116A)



*Conferences on the film include study of preliminary sketches of suggested gags*

making it possible for the artist to get the proper detail into the different frames.

Camera angles and tricks of the live-film photographers were used in certain scenes. One of these concerned Snow White as she stood sobbing on the front stoop of her cottage. We wanted to give the effect a photographer gets on a truck-back from a close-up. She was to be shown full length at first and then as if a mythical camera were being moved away from her, she was to telescope out into a spot. The actual drawing of this shot had the animators talking to themselves until we devised a method by which it could be handled. The artists were permitted to work on larger paper than was normally used so that they could produce accurate detail. When these large drawings were completed they were



*"Three's  
company* when it's me..  
my pipe.. and  
**VELVET**"



—the **MILDNESS**  
of fine old  
Kentucky Burley  
aged in wood

—the **FLAVOR**  
of pure maple  
sugar for extra  
good taste

Velvet packs easy in a pipe  
Rolls smooth in a cigarette  
Draves right in both

*Better  
smoking  
tobacco*





(Continued from page 114A)

ing process, let's look at the figures first and then the backgrounds. With his preliminary sketches approved, the animator proceeds to rough out the sequence he has been given to draw. He prepares the sequence with skeletonized figures and then has it photographed with a thirty-five-millimeter camera. With a magnifying glass he looks into a "movieola," a sound-equipped device that gives him an idea how the scene is going to look on the screen. If he isn't pleased with the result, he can start over or revamp his sketches until they suit him. The animator does not concern himself with color, this work being handled by specialists. When he is satisfied with his first rough tests, the artist proceeds to refine the most important drawings of the sequence. It is in these frames that the action is set; the figures are drawn in poses that delineate their character. Once the key drawings are completed, the assistant animators swing into action. They do the "extremes," which may be best described as those frames in which the start and finish of a specific action are depicted. The relatively unimportant parts of an action are drawn by the "in-betweeners."

The painting and inking department traces the completed drawings on sheets of celluloid in ink and then paints them on the reverse side, according to the instructions given by the colorists. The colors are all indexed, there being between 750 and 1,000 shades and hues in regular use. This work completed, the "cells" are ready to be photographed by the color camera.

The multiplane backgrounds are traced on heavy drawing board, colored and then fitted into place in the intricate camera. The stop-motion color camera takes one exposure at a time. It is a large affair and shoots downward on the material to be photographed. In front of the background is placed the celluloid sheets, one for each character in the scene. After "cells" in the No. 1 group are photographed, they are taken out and the No. 2 set put in their place against the same background. This is carried out until the scene is finished. Then a new background is set in place and other cells are snapped until the picture is completed. The music, sound and dialogue added, the picture is ready to be shown on the screen.

## Putting the Atom to Work

(Continued from page 693)

One type of atom smasher builds up its voltage by cascades of transformers and condensers. Another stores up great quantities of static electricity. The cyclotron, a third type, is a complex machine that cleverly builds up tremendous speeds in atomic particles from comparatively low voltages.

The cyclotron consists essentially of a shallow round vacuum box placed between the poles of a mighty electromagnet. Inside the vacuum chamber are two flat hollow D-shaped high-voltage electrodes. The eighty-five-ton magnet of the cyclotron is so powerful that ordinary watches are stopped by it. Liquid oxygen, having magnetic properties, swirls toward it instead of falling straight to the floor when poured into the air. The magnet even tries to unwind the coiled filaments of heat elements placed between its poles.

In use, the vacuum chamber of the cyclotron is pumped out until only one thousand millionth of the normal number of air molecules remain inside. By means of a radio frequency oscillator an alternating potential of 50,000 volts is maintained between the two electrodes inside the vacuum chamber. The polarity of these electrodes changes 23,000,000 times per second. From a central heated filament in the vacuum chamber a stream of electrons ionizes heavy hydrogen atoms that are present, forming a source of deuterons which are to be used as bullets. These deuterons, having a positive charge, are attracted toward the D-shaped electrode that happens to be negative at that instant. But as they move toward this electrode the tremendous effect of the magnetic field in which the chamber is located pulls the deuterons into a curved path. The strength of the magnetic field is so adjusted that the deuterons make one-half a revolution in one-half a cycle. Thus as the polarity of the two D-shaped electrodes reverses, the deuterons will be attracted toward the electrode from which they formerly were repelled, and so gain in speed or energy.

As their speed builds up in 50,000-volt jumps the deuterons spiral out toward the circumference of the chamber. After being kicked 150 times by 50,000 volts they

(Continued to page 118A)





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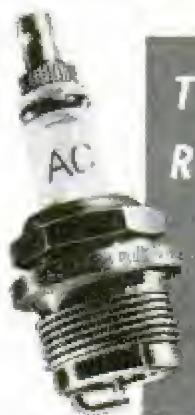
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SIGN  
when you need plugs  
or plug service*



*To remedy spark plug wear—  
REPLACE WORN PLUGS  
WITH AC  
QUALITY  
SPARK PLUGS*

**AC SPARK PLUG DIVISION**  
General Motors Corporation • FLINT, MICH.

(Continued from page 116A)

attain an energy of 7,500,000 electron volts, which means a speed of 70,000,000 miles per hour. As they approach the rim of the chamber the deuterons are guided by an electrostatic deflection plate to pass through a thin metal window out into the air, where they crash into any target placed in their path.

When the deuterons smash into the target some of them pierce the nuclei of the target atoms. If they happen to lodge in the nuclei they create overweight, unstable bodies which begin radiating beta and gamma rays until they become stable again. This kind of radiation is radioactivity and hence the atom is temporarily radioactive. The activity varies for each element, radioactive lithium having a half-life of only part of a second, while radioberyllium has a half-life of several years. Sodium, which can be used as common salt, has a half-life of a little less than fifteen hours.

Chemically, the radio isotope of an element is exactly the same as the stable atom. They can go through exactly the same chemical processes and transformations. That is the reason why they are so valuable as "tracers." Their radioactivity indicates their presence to electrical detecting instruments. By tagging phosphorus atoms by making them radioactive and then using the phosphorus as food, the absorption of phosphorus by the bones can be followed step by step. Iron, calcium, and other common food elements can be tagged the same way and their absorption by the body traced. Such tracer studies are going to require years to complete. Eventually this work alone may be regarded as important biologically as the development of the microscope.

The use of temporarily radioactive elements in studying and combatting cancer also holds high promise but such applications will not arrive for several years. At Berkeley and at other research centers such investigations are going ahead slowly because the scientists want to know exactly what the benefits will be before they start in. Two thousand white mice are being treated and observed at the Berkeley laboratory and if the effects of the rays on these mice turn out as well as hoped, cautious treatments will be tried on human patients.



One of the things receiving special study is the neutron, the comparatively unknown electrically inert particles that help form the structure of the atomic nucleus. Discharged as rays, neutrons in some respects are from five to ten times as lethal as X-rays. They are the chief reason for the water barrier around the cyclotron and the many elaborate precautions taken to protect the workers. Destructive as they are, they may become a new tool of medicine because they seem to be more deadly to cancerous tissue than to normal tissue.

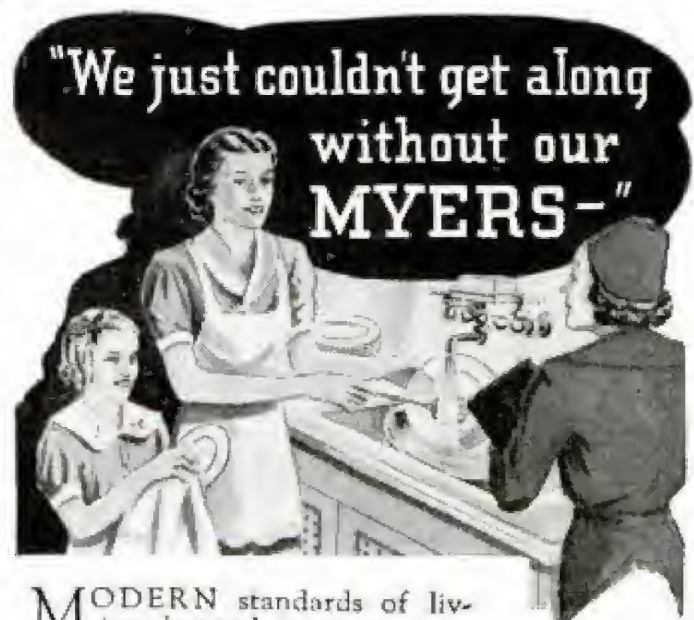
There also is the possibility that metallurgical knowledge will be vastly increased when current experiments are completed. It is hoped that a definite idea of the migration of atoms during the heat-treatment of metal can be obtained, through studying the movements of atoms made radioactive before heat treatment. Late in 1937 the cyclotron created two elements comparatively new to science, elements Nos. 92 and 94.

This year a gigantic cyclotron with a 220-ton magnet is being erected at the University of California. In this tremendous machine deuterons will be hurled with a force of 20,000,000 volts and alpha particles will be speeded up with an energy of 40,000,000 volts. With this machine, it is hoped, far more can be learned about the atom than ever before.

Physicists think that the study of the atom may open up brand new fields of knowledge.

"While the view that some day power plants may be run by the release of sub-atomic energy and that the nuclei of atoms may be used as fuel appears fantastic," one of them declares. "Nevertheless proof of the equivalence of mass and energy is none the less of great practical importance. It is conceivable that in our lifetime this great principle will play a vital role in technical developments which are far beyond our dreams—for such has been the history of science."

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## Tornados are His Hobby

(Continued from page 683)

es 154 4

faster it rises, the harder it whirls. Because of this, a small area of low pressure is produced; the temperature is reduced and condensation of moisture takes place. The water vapor condenses as steam or cloud and thus the twister becomes visible. When it hits the earth, the dust it sucks up changes its color to deep black. Many of the tornados starting at cloud level gain in size and energy as they move toward the earth, others lose their force. Some never reach the earth.

The state of Kansas is generally regarded as the cradle of the tornado but on a per unit area basis, the weather man's charts show that parts of Iowa, northwest Missouri, and parts of Arkansas outrank Kansas in this regard. Although the tornado belt lies in the mid-central section, the southern and eastern states receive a share of these vicious storms.

Inasmuch as the tornado can be seen in the open country at such great distances and its direction of motion can be so well charted a person in its path may have ample time to get out of its way. The best place of refuge is in a cellar or cave. Tornado cellars, commonly known as cyclone cellars, are built adjacent to farmhouses and double as refrigerators for the storage of fruits, vegetables, and dairy products.

If it is your misfortune to be caught in a tornado and you are in a frame dwelling, Flora suggests you get into the southwest corner of the basement. No matter what happens to the house, it's not likely you will be hit by any falling debris there. Stay out of the basement of a brick house; when a tornado hits a house of this type, the wreckage falls directly into the foundation.

"Out in the open country," explains Flora, "the best thing is to lie down in a ditch or gulley, the deeper the better. But in such a crisis, you can't be too particular. I knew of a man and his wife who were trapped in a storm near Topeka. They crouched in a shallow excavation that had been used for storing apples and although it was not more than three feet deep, they escaped injury, while their house and barns were carried away.

"There is record of a Kansan lying behind a tree and locking his arms about it.



251544.  
 Luckily, the tree was not uprooted but the man's face was severely cut by sand and fine splinters whizzing through the air.

"If you have no other alternative, run as fast as you can to the northwest, at right angles to the movement of the storm. When the tornado is only a few hundred yards in width, it is possible to evade it in this manner."

It's problematical what a tornado would do to a modern steel reenforced type of concrete building. The chances are one might resist the force of a storm to a marked degree, the meteorologist says. If you should be in one when a tornado is getting ready to strike, your best bet is to crouch against one of the inside partitions.

According to Flora, the nautical equivalent to a tornado is a waterspout. The suction in the center of the cloud lifts up a column of water. It may not rise very high, perhaps not over twenty feet.

Although the hurricane has no funnel-shaped cloud, its wind velocity often reaches 125 miles an hour, blowing over an area of several hundred miles for several days at a stretch. They do not occur north of the Gulf of Mexico or the South Atlantic states and quickly lose their force as they pass inland.

### 434. ————— Car Parking Lights Turned on by Photocell on Dash

Operated by a small photocell device mounted on the instrument panel, automobile parking lights turn on and off au-



tomatically at the proper hours. The unit, no larger than a matchbox, switches on the parking lamps when the sun sets and switches them off when the sun rises.

Source: *Popular Science* - 4/19/44

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**Torturing Metal to Make It 'Talk'**

(Continued from page 668)

back and forth repeatedly until it snapped. Perhaps you have noticed that the wire became warm to the touch at the point under stress—heat due to the friction of molecules sliding back and forth over each other.

In the early days of the automobile, rear axle failures were frequent. Even today, when an auto axle breaks, it is almost invariably the back one. Why not the front one? Because most axle failures are due to the fatigue of the metal and most such failures are due to the bending of rotating



Setting limit of compression for small spring about to undergo fatigue test

parts. The front axle does not rotate, hence is not subject to so much fatigue. A rotating metal part under load is subject to alternate tension and compression, like a spring—stresses conducive to metal fatigue. An airplane propeller, on the other hand, is subject mostly to fatigue from vibration.

The treacherous thing about the fatigue of metals is that there is no warning. Examine a car axle about to break from fatigue and you will find no deformation, no sagging, no visible cracks. The axle appears sound, yet within the next five miles it may give way from fatigue. Garage mechanics usually refer to such a failure as "crystallization" of the metal but metallurgists dislike the term since the micro-



scope shows that metal is crystalline to start with and retains its crystalline structure throughout a fatigue test. They prefer to look upon fatigue as a breakdown of the atomic structure of the metal caused by the atoms sliding back and forth over each other like a deck of cards being flexed in the hands.

How to tell when failure from fatigue of a particular alloy is likely to occur? That was the problem faced by Westinghouse and other industrial research men. They solved the problem by putting metal samples on the rack and torturing them to death.

If a metal part is to be subjected to a pull, twist or vibration in actual use, samples of various alloys being considered are placed under a comparable stress in a testing machine which subjects them to the strain they must withstand until they fail.

Let's assume a metal for a spring in a refrigerator door is being sought. Samples of various alloys are placed in motor-driven machines and subjected to alternate tension and compression like they would receive in service, a counter recording each cycle until each sample fails. Suppose one snaps at 500,000 cycles, the second at 750,000 and the third at 1,000,000. If it has been estimated the refrigerator door in which the spring is to be used will be opened and closed half a million times during the lifetime of the machine, the research men do not select the alloy which failed at 500,000 cycles. They pick the one which failed at 750,000 or even 1,000,000—to provide the added safety factor. They know the longer-lived ones will outlast the refrigerator.

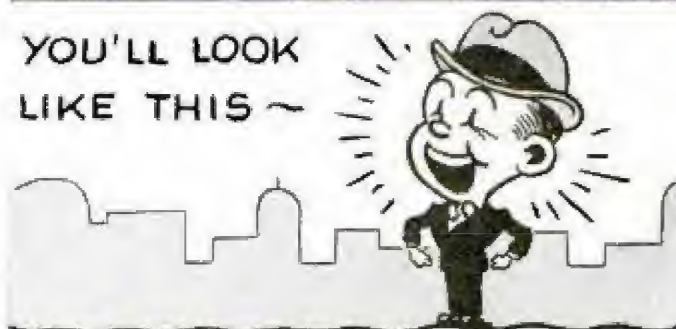
It's the same with other metals for other purposes. They torture metals to destruction and choose for specific purposes only those which are tough enough to withstand a lot more than the strain they will be called on to bear, whether it's a straight pull, a twist under load, or continuous vibration.

Some automobile factories today specify rear axle gears able to stand sixty miles of travel in low gear at full engine torque, more strain than the gears are likely to bear during the life of a car in ordinary travel. Not so long ago no one could have guaranteed a particular alloy to meet this specification. The metals were available, were even used, but no one knew beyond

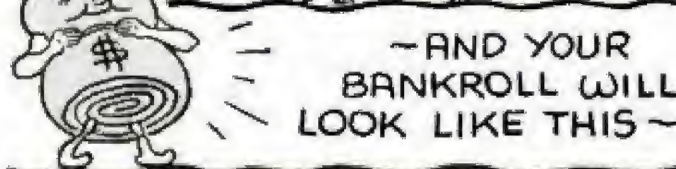
(Continued to page 125A)

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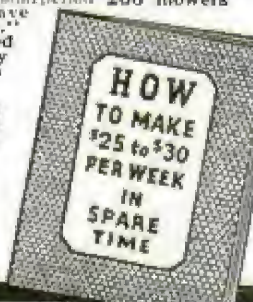
Remember, no experience is necessary. Most men sharpen lawn mowers in spare time only. J. B. Van Dine writes: "Some weeks I earned \$40 a week with my ideal just as a side line." "I have sharpened over 500 mowers and every customer is well pleased." A. M. Larsen writes: "I average 9 mowers a day." Roy F. Stier says: "I live in a town of 500 and to-date have sharpened 200 mowers \$1.25." Edward A. Mynderse writes: "Have sharpened around 500 mowers this season." Nick Baltes says: "Last summer I sharpened 200 mowers at \$1.00 each." Bucher Battery Co. writes: "We sharpened over 600 mowers last year at \$1.50 each."

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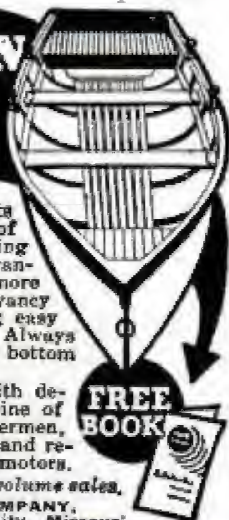
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This Class Pin, any letters, any numerals, Silver Plated 25 or more, 50¢ each; 7 to 24, 35¢ each; 1 to 6, 40¢ each. Gold Plated add 10¢ each to above prices. Sterling Silver add 20¢ each. Sterling Silver Ring as shown, 26 or more \$1.50 each; 12 to 25, \$1.75 each; 1 to 6, \$1.95 each. Write for **FREE Treasure Book**.

**Metal Arts Co., Inc., Factory 44, Rochester, N.Y.**

**RINGS**

**BURN YOUR NAME ON TOOLS**

**WITH THE ARKOGRAF**

**PROTECT YOUR TOOLS FROM THEFT**

Write with electricity any name or design on the hardest and finest tools and instruments, or any metal, like writing on paper with pen or pencil. **Complete Outfit \$3.50**—Prepaid Anywhere. Interesting illustrated circular free. Write today. Agents wanted.

**ARKOGRAF PEN CO., 3927 S.E. Stark St., Portland, Ore.**



(Continued from page 123A)

any question whether a particular alloy, if used in gears, would go thirty miles or sixty miles in low gear at full engine torque without failing. The only way to find out would have been to try it. Now there's no guesswork. Research men know in advance what the metal will do. They find out by torturing it until it fails.

Heat treatment gives added tensile strength to steel but does not always add proportionately to its ability to withstand fatigue. Cold working, however, increases the resistance to fatigue of some kinds of steel. Most common alloys have been subjected to so many types of fatigue tests that metallurgists are familiar with the general fatigue characteristics of each. But they still continue to test metals to destruction. Why?

The answer is simple. They do it to improve design. The shape as well as the composition of a metal part subject to continuous stress determines its strength. So after the alloy best suited to withstand a particular strain is determined, the shape of the part must be decided. Various shapes which can be utilized are tested in the torture machines until they fail. The one which lasts the longest may be selected or perhaps even the shape of this one is altered to increase its strength still more. Sharp corners usually are avoided in metal parts where strain is a factor because a sharp corner is one place where failure is most likely to occur. Increasing the radius of such a corner almost invariably increases the strength.

In addition to the ordeal by water to determine resistance to erosion, metal also is subjected to an ordeal by fire, a form of torture calculated to determine the rate of "creep" of an alloy. Metal under stress at high temperature has a tendency to "creep" or elongate like hot taffy under the stress of pulling. In the case of certain turbine parts, for example, this creep continues year after year. But these parts fit to extremely close tolerances. So unless turbine engineers know exactly how far the material will creep in twenty years, they may use a part which fits nicely when installed but which will not function properly in a few years.

So research men today use a creep testing machine to find out in a short time just

(Continued to page 126A)



**NOW...FOR**  
**only \$425**  
**DOWN**  
*You Can Get a*  
**CUB**  
*and Learn to*  
**FLY**

Because you can buy a new 1938 Cub on easy monthly payments, because it lists at only \$1270 F.A.F. factory, and because owners average more than 25 miles to a gallon of gas and 350 miles to a quart of oil—here is a plane that YOU can own!

## FLYING COURSE **FREE!**

Pay only \$425 down and you not only take delivery of your new 1938 Cub—the safest, most dependable and easiest-to-fly plane on the market today—but you also get a regular course of dual flying instruction by government licensed instructors **FREE**.

## SEND TODAY FOR FULL DETAILS

concerning the new 1938 Cub and the free course of dual flying instruction.

Also send for free illustrated Cub folder and name of your Cub dealer. Piper Aircraft Corporation, 58 M Street, Lock Haven, Pa., U.S.A.



**GET YOUR WINGS NOW!**  
Enclose 10c in stamps or coin for your handsome "wings" insignia pin. Finished in gold, it's a beauty!

**PIPER AIRCRAFT CORPORATION**  
58 M Street, Lock Haven, Pa., U. S. A.

Please send me full details about the free flying course; also free Cub folder and name of my Cub dealer. Enclosed find 10c for my "wings" insignia pin.



NAME \_\_\_\_\_

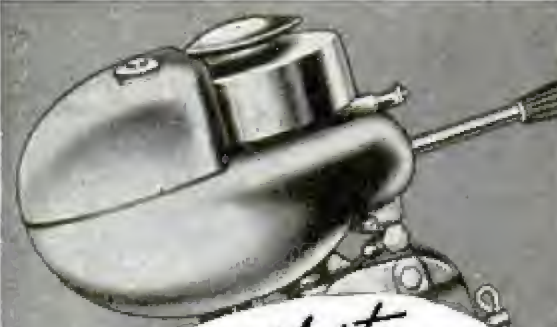
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CITY \_\_\_\_\_ STATE \_\_\_\_\_

**COUNT THE CUBS**  
**THE WORLD'S FASTEST SELLING AIRPLANE**



(Continued from page 125A)



**The Most for your MONEY!**

Quality does not always mean high cost - look at the new 1938 line of NEPTUNE Outboards! Priced from \$39.50 (1.2 H.P. Single) to \$164.50 (16 H.P. Master Twin) built to endure years of hard steady service - you'll find a motor of the exact type and size you require, at a price lower than you expected to pay.

Combination air and water cooling, automotive float-needle carburetor, Monel metal shafts, under-water silencing, high tension fly-wheel magneto, gasoline control in steering handle. Take a look at the new light-weight 1.2 H.P. Single and the smooth running 9 H.P. Alternate-Fire Twin!

**NEPTUNE Motors**

BUILT FOR SALT WATER AS WELL AS FRESH WATER

**MUNCIE GEAR WORKS, Inc.**  
Muncie, Indiana

**FREE** Send for illustrated folder giving details and prices.

**NEW BENJAMIN AIR PISTOLS**



Powerful - Accurate - Economical - Practical - Adjustable Shooting Force - Amazing Maximum Velocity - cal. 177 or 22 and BB - For Targets and Small Game - the only Genuine Compressed Air Pistol for Shooting BB on the market - Single Shot with Bolt Action - Hammer Fire - Rear Trigger - Safety. Price \$7.50. Holster \$2.00. Also 177 and 22 Single Shot Air Rifles \$7.50 - Single Shot BB Air Rifle \$6.00 - 25 Shot BB Repeater Air Rifle \$7.50 - at Dealer or Direct - No license required - Safe for indoor use. **FULL DETAILS - TARGETS - FREE - WRITE TODAY** Benjamin Air Rifle Co., 891 Marion St., St. Louis, Mo.

**Thompson**  
**BEATS**  
**the World**  
**on BOATS**

**Only Boats With Full Length Spray Rails**  
Keep passengers perfectly dry—even at high speeds. Catalog also shows today's five most popular models of sailboats. Two big factories. Prompt shipment.

**CATALOG FREE**  
Write for your copy. State kind of boat in which you are interested.

**THOMPSON BROS. BOAT MFG. CO. (87)**  
213 Ann St., **ESHIGO, WIS.** (Write to either place) 113 Elm St., **CORTLAND, N. Y.**

**Better Built Lower Prices**



how much metal will creep in a long time. It is a cylindrical electric furnace with twelve holes for test specimens under different stresses, and a larger compartment for pretreatment of specimens without stress. Test specimens are supported on knife edges and loaded by levers and weights. Two methods of measuring creep are used. A dial gauge reading to one ten-thousandth of an inch is employed to measure the relative vertical displacement of comparison rods extending to the top of the furnace. The furnace also is surrounded by a track on which a micrometer-microscope carriage moves. Measurements are taken with this instrument by sighting through quartz windows in the wall of the furnace upon engraved platinum targets. Even the material used for bolts in a steam turbine must be creep tested in this fashion, because if a bolt creeps enough it may relax and lose its tension.

All this torturing and testing of metals adds years of useful life to your automobile, your refrigerator, your electric fan or any other machine containing metal parts subjected to strain. The tougher the job the metal must do, the more cruel the torture it must withstand before it is accepted. But, once approved, it's a tailor-made metal for the job to be done.

Not so long ago the user tested the product. Today the research man does the test work. He breaks axles and motor shafts and refrigerator door springs in the torture chamber so they won't break after you buy them.

1494.

## Fluorescent Ink for Printing Glows in "Black Light"

Incorporated into printing ink, fluorescent materials make the words glow when the page on which they are printed is subjected to ultraviolet rays, or "black light," so called because it is invisible. Under ordinary light the words are difficult to read, but in black light, the letters stand out boldly in violet. Books and magazines printed with this ink can be read under sun lamps of the ultraviolet type. Two-watt argon lamps, now on the market, give a glow too feeble in visible rays for reading, but they make it possible to read pages printed with fluorescent ink.

*1130 - Fluorescent Products*



# Oh Boy! How Grand I Feel

"NOW I know there IS a difference in the way laxatives work since I used the ALL-VEGETABLE Laxative, Nature's Remedy (NR Tablets). One NR Tablet convinced me... so mild, thorough, refreshing and invigorating."

Dependable relief for sick headaches, bilious spells and that tired-out feeling, when caused by or associated with constipation.

**Without Risk** try NR. Geta25c box from any druggist. Use for one week, then if you are not more than pleased, return the box and we will refund the purchase price. That's fair. Try it.



**NR TO-NIGHT**  
TOMORROW ALRIGHT

## "THE NEON LIGHT sets you RIGHT" ★TEST-O-LITE

At Electrical Stores or \$1.50 Postpaid  
Handiest electrical tester made: quickly locates trouble in electric circuits, fuses, cut-outs, motors, radios, etc. Has 1,001 uses for electricians or home. Tests any voltage 110 to 550; tells A.C. from D.C. Excels ordinary clumsy test bulb. Fountain-pen size; with pocket clip. Lifetime guarantee.  
L. S. BRACH MFG. CORP., 55 Dickerson St., Newark, N. J.

## RE-STRING RACKETS AT HOME



Write for our 1938 Illustrated Catalog and Instruction Book.

W. A. BICKEL & Co., Dept. A-5, 137 N. Marion, Oak Park, Ill.

## TWO-CYLINDER STEAM ENGINE

for small boat models complete with propeller, shaft, fire screen, denatured alcohol torch and fuel tank. Torch will start cold engine in 2 minutes, run it for 12 minutes.

Price complete as described \$3.00 postpaid  
Shawnee Engine Co., Box 162, Station D, Cincinnati, O.

## Print Your Own

Cards, stationery, circulars, tags, labels, advertising, etc. Save money. **Print for Others; Big Profits;** easy rules sent. Will do popular Raised Printing like Engraving. Junior outfit \$9. Senior outfit \$17 and up. Send for free catalog and all details.  
KELSEY PRESSES, F-37, MERIDEN, CONN.

**A & N SUPPLY CO.**

Bargains—Military, Sport Goods, Firearms, Clothes, Shoes, etc. Send 10¢ for new catalog, to be redeemed on first order.

EST. 1868 A & N Supply Co., 4772 Lester St., Richmond, Va.

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Over 100 pages! Beautifully Printed and Illustrated! Trailer Suggestions and Ideas galore! Catalog shows America's greatest line of Trailer Parts and Equipment at lowest prices. Everything from wheels to top. Rush 25¢ today. Satisfaction positively guaranteed!

**TRAILER SUPPLY CO.** Box 438-A WAUSAU, WIS.

## BUILD IT YOURSELF

**The Jim Dandy Cabin Cruiser**  
The Trailer that has everything. Classy! Roomy. Easy to build in any size with my simplified Plans and Instructions—Price \$1.00. Rush dollar bill today to  
**JIM DANDY** Box 125-A WAUSAU, WIS.



Rust and scale have accumulated in your radiator all winter. They are choking the delicate veins that circulate water and keep your motor cool. An overheated motor is a lazy motor. And overheating may cause costly damage. Clean out your radiator. It costs only 10¢. (25¢ for the largest trucks and tractors.)

You can do it yourself in a few minutes. Pour a little SANI-FLUSH in the cooling system. Run the engine. (Follow directions on the can.) Then drain, flush and refill with clean water. Do this regularly, twice a year. Keep the radiator clean and clear. Motors run cooler. Save power. Save repairs. SANI-FLUSH can't harm motor or fittings. You'll find SANI-FLUSH in most bathrooms for cleaning toilets. Sold by grocery, drug, hardware, and five-and-ten-cent stores. 25¢ and 10¢ sizes. The Hygienic Products Company, Canton, Ohio.

**Sani-Flush** *Safe NOT CAUSTIC*  
KEEPS RADIATORS CLEAN

## NEW BRUSH PLATING OUTFIT For AUTO PARTS

Connects to a battery with no tanks necessary. Plates on iron, steel, brass, copper, etc. Almost as simple as painting. Hundreds of car owners waiting for this low-cost plating. Improves appearance and value of the car. Your opportunity to make good income plating auto parts, bathroom fixtures, reflectors, mirrors, etc.

### FREE PROOF

Write quick—big season here. Get FREE PROOF and particulars that put you in a paying business of your own.

**GUNMETAL COMPANY**  
AVENUE M DECATUR, ILL.

When writing please mention Popular Mechanics



# PATCH HOLES IN WALLS

EASILY AND PERMANENTLY



Rutland Patching Plaster makes a perfect patch as lasting as the wall itself — and anyone can use it.

## Amazing NEW GLAZE Beautifies and Protects



Car Owners! Meet MASTER GLAZE — the sensationally different luster for new and used cars!

Not a wax — not an oil polish — not a paint — nothing that "seizes" over the surface. A creamy liquid — quick and easy to apply! Gives a hard, glass-like surface. Even gasoline cannot dull it! Lasts six months to a year! Amazing luster — beautiful, sparkling clean and brilliant! Doesn't fingermark — doesn't smear! Seals the pores — protects! Nothing like it!

**FREE** Write now for Free booklet and **SAMPLE OFFER**. Free Trial offer. Just send your name and address.

MASTER GLAZE CO., 7720-28 W. HARWOOD AVE., MILWAUKEE, WIS.

## GOVERNS SPEED OF ANY GAS ENGINE

It's easy and economical to supply your own power for operating all types of machinery, and do more work for less money. Simply remove the engine from a used automobile or truck, set it up where you like, attach a PIERCE UNIVERSAL GOVERNOR, start the engine and you have constantly controlled power for the operation of electric lighting plants, arc welders, refrigerating units, air compressors, feed grinders, hoists, saw mills and innumerable other applications.

The load may change but the PIERCE UNIVERSAL GOVERNOR will maintain a uniform engine speed. For close regulation of speed and dependable performance PIERCE GOVERNORS are never equalled. Installation is simple. Either V or flat belts can be used. Complete Governor outfits are also available for nearly all makes and models of industrial engines.

Write for illustrated literature and prices.

THE PIERCE GOVERNOR COMPANY  
1801 Ohio Avenue, Anderson, Indiana

**PIERCE GOVERNORS**  
THE BRAINS OF ANY GAS ENGINE



## Treasure Island of 1939

(Continued from Colorado Section)

water colors, and prints. Prismatic reflectors will be used to help give the proper illumination.

Hundreds of exhibits will represent various industries and separate companies, some of which are erecting their own buildings. One great palace will be filled with architectural, building, and building-supply exhibits, with room outside for model homes and landscaping.

Two systems of avenues and courts, intersecting at a central 400-foot tower, form the main design around which the larger exposition buildings are grouped. The Avenue of the Seven Seas leads to the "Court of the Hemispheres" and this in turn leads to an open air "theater of the sky." The main cross-avenue terminates in a great lagoon which is to be used for water pageants and fireworks shows. The north end of the island contains parking space for 12,000 cars and adjacent to it is an amusement zone, called "forty acres of fun," where thrills, stunt rides, sideshows, and restaurants and typical carnival concessions will be located. In all, 600 concessions are to be granted for the amusement area.

A group of native villages transplanted, inhabitants and all, from the South Seas, will be located near by. At the south end of Treasure Island, protected on three sides, is the "Port of the Trade Winds" where trade ships, junks, square riggers, and yachts will be moored. A roadway lined with olive trees and four miles in length will circle the island.

The exhibition palaces will have a combined floor space approaching one million square feet and will cost \$7,000,000 to complete. It would take 20,000 freight cars, a train 200 miles long, to haul the lumber, steel, and concrete used in construction and 100,000 timber piles are being used as foundations for the buildings.

Foreign participation is to include official exhibits from Japan, Egypt, Cuba, Mexico, Netherlands, East Indies, Panama, Santo Domingo, Honduras, Nicaragua, Peru, Venezuela, and other countries of the Orient, the South Seas, and South America. Canadian provinces will be represented and exhibits are being prepared by Hawaii and Alaska. More than half the



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states are participating, some of them planning to spend more than \$100,000 each on exhibits and displays. Exhibits are also being prepared by several departments of the federal government.

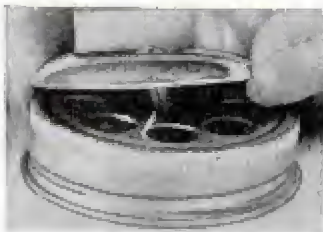
With an expected attendance of 20,000,-000 visitors during its nine months of life, and perhaps 50,000 guests per hour during attendance peaks, the exposition engineers have had to arrange for every convenience of a complete city. A pipe line to carry water from San Francisco via the bay bridge to the island, fire-protection systems, sanitary systems and telephone and telegraph lines, are some of the details. Water alone will cost \$600,000, supplying an estimated average demand of 1,600,000 gallons daily. A six-lane roadway connecting with the bay bridge and arranged so that there are no intersecting left turns against traffic streams at any point is under construction. Thousands will travel to and from the fair by fast, convenient ferry-boat connections.

The exposition will open February 18, 1939 and continue for 288 days until December 2. Approximately \$50,000,000 is being spent on the exposition, including federal, state, and public subscriptions, under the guidance of a non-profit exposition corporation.

The theme of the fair is to be a celebration of progress in the west since the last world's fair in San Francisco in 1915. It is dedicated to the two great bridges of San Francisco Bay, largest and newest in the world, to the China Clipper flying boats, and to the recent hydroelectric projects of the west, all symbols of western progress.

H-193

### Water Pours from Bottle Cap without Unscrewing It



pouring water without unscrewing the cap. Essentially, the cap is a simple valve.

Although it is tight enough to keep out dust, foreign matter and odors, a water-bottle cap just introduced permits

Send return postage to our Bureau of Information to learn the name of the maker of any device described in this magazine.

W. O. Freeman Jr.



## "POLISHING'S A CINCH with DU PONT POLISH"

Now you'll find it easier, quicker than ever to make your car mirror-bright. A little brisk rubbing with Du Pont No. 7 Polish, and your car sparkles like new. No. 7 Polish is made by Du Pont, world's largest maker of modern car finishes. That's your assurance it's right for the finish on *your* car.



Sample for You! Send 6c. post mailing cost, for sample can of No. 7—enough for fenders and hood. (Offer good in U. S. only.) Write Du Pont, Dept. PM-1, Wilmington, Del.

Always ask for

## DU PONT POLISH



**I'LL FIX THAT  
IN A JIFFY!**



### CANNED WOOD MAKES HOME REPAIRS EASY

Anybody can do a fine job of repairing quickly—broken chairs, loose casters, holes in wood, nicks, cracks, screw holes, loose drawer pulls, etc. with this canned wood that handles like soft putty and quickly hardens into wood you can drive nails and screws into, paint or carve. Try it. Paint, hardware and 10¢ stores sell PLASTIC WOOD in 10¢ and 25¢ tubes, 35¢ cans.



## PLASTIC WOOD

**HERE'S THE  
MASTER  
FIXER**

Quickly, permanently joins and repairs china, glass, wood, celluloid, etc. Transparent—or Metal color. Get it at paint, hardware or 10¢ stores.



**Old English  
CEMENT**

## Auto-Glide

**120 MILES PER GALLON**

POWER—1½ or 2 H. P. Cushman engine. New 2-Speed Transmission—4-to-1 ratio in low! Starts up steepest hills, pulls Side-Car with heavy load to the top! Regular speed is high, 35 mi. per hour. **ECONOMY**—a drug store has driven its Auto-Glide 9,000 miles in 8 months for deliveries, used only 3-gal. of gas a week—¾¢ a mile. **RUGGED**—one owner has traveled 1,000 miles a month for 8 months, no replacement 3 models: (1) Auto-Glide, illustrated, (2) Kart-Pac, with parcel carrier, (3) 3-wheel Side-Kar model—carries an extra passenger, or 300 lb. load. Ideal for deliveries, etc. Side car quickly removable.



**WRITE** Send for free book and prices on new improved models. **DEALERS:** Write quick for details of Special Offer! **CUSHMAN MOTOR WORKS, Dept. Q-5, Lincoln, Nebr.**

## Across Africa on One Lung

(Continued from page 709)

the old bushing and fitted the new one.

There had never been a motor vehicle over the 500 miles from Mao to Abeshir. But scarcely a day passed that we didn't meet a caravan of from two to 100 camels. And there were always the pilgrims, crowning a life of religious devotion with their sacred journey to Mecca. Old men, frail and feeble, walking across Africa.

Once a big "hyena" jumped out into the trail. The hyena is a notorious coward so I chased him a quarter of a mile before discovering he was a lion. Often we raced with antelope and ostrich where the trail was hard and smooth. One morning we stopped to photograph one of the great



Repairing the tires after thorns caused sixteen punctures at the same time

herds of long-horned, humpbacked cattle that roam the grasslands of the Sudan. The herdsmen shouted a frantic warning, but it was too late. They charged! We fled to our machines, leaped on and started. But there wasn't a chance of out-running those monsters in the heavy sand. They were only thirty feet behind us when my eye fell on the hand oil pump on the frame.

"Pump!" Frantically I motioned to Flood.

Desperately we worked the plungers up and down. Thick blue clouds of smoke began to pour from the exhausts. Snorting and pitching, the maddened animals broke ranks and plunged past.

Then came a week's run of bad luck with

(Continued to page 133A)



# CARBURETOR

U. S. Pat. No. 2,082,106

## KAYWOODIE



No. 178

\$4

### SEE THAT CARBURETOR?

That little patented inlet in the bottom of the bowl does something really worth while, and you'd be surprised how many smokers say so. It's a Carburetor, that lets in an updraft of air that keeps the inside of the bowl dry at all times. The tobacco burns more evenly, produces a better flavor. The harder you puff away at the pipe, the more updraft, so your pipe stays cool *always*, instead of getting hotter. Yessir, good old Kaywoodie quality in every part of the pipe. See it, and you'll buy it.

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## UTILITOR TRACTORS

Your most Economical Power for small farm plowing, discing, cultivating, mowing, hauling, etc. Thousands in use 10 to 15 years and still going. New improved riding and walking models, 3 to 12 h.p. Before you buy INVESTIGATE THE UTILITOR. WRITE FOR FREE CATALOG DAYTON, OHIO UTILITOR Co. DEPT. A



THE  
WEEZEL  
CATCHES  
FISH!

2 ACTIONS IN 1 BAIT

Casting size WEEZEL, 3/4 oz., 17 colors, \$1 ea. Fly Rod size 1/20 oz., 12 colors, 60c ea. Muskie-Saltwater 1 oz., 17 colors, \$1.50 ea. If your dealer can't supply you, we will. Write—THE WEEZEL BAIT COMPANY Dept. T, Disney St. - Oakley, Cincinnati, O.

FREE FOLDER—SHOWS BAITS IN FULL COLOR



## CHEAPER TENNIS

EARN MONEY, TOO!

NOW—you can buy Willie's fresh, genuine Eclipse SPLIT GUT tennis strings direct-from-factory for as little as \$2.25 PER SET postpaid. Also—excellent quality SILK at only 65c per 37 ft. coil, postpaid. Rush your order now! Satisfaction GUARANTEED. New 1938 CATALOG of Tennis Frames, Vases, equipment now ready. Get your FREE copy. Send today. H. E. WILLIS CO., Dept. 1555, 1047 W. 47th St., CHICAGO, U. S. A.

## STAR METAL BOATS



NON-SINKABLE  
CARE-FREE  
ECONOMICAL



Only complete line of rubber cushioned metal row boats, outboard motor and sail boats, including a new utility inboard model. Better quality, lower prices. STAR TANK & BOAT CO., Dept. P GOSHEN, INDIANA

Makes marvelous movies at everybody's price  
CINÉ-KODAK EIGHT—only \$34.50

See it at your dealer's

## OUR FINEST PORTABLE



## 1938 SPEED MODEL CORONA SILENT

"Over 200 five-stroke words a minute"—that's what speed experts can do on this up-to-the-minute machine. See its beauty, its completeness... try its quiet, easy operation... and nothing else will satisfy you. Famous Floating Shift, Touch Selector. Free case and touch chart; free trial.

YOURS  
FOR ONLY  
\$100  
A WEEK

L. O. Smith & Corona Typewriters Inc.  
Desk 5, 720 E. Washington Street  
Syracuse, N. Y.

☐ Send free Corona book and terms  
☐ Tell nearest dealer to call

Name.....

Address.....

City..... State.....



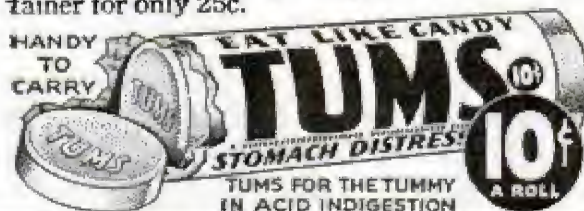


I ALMOST STARVED  
UNTIL I FOUND  
TUMS. NOW I EAT  
THINGS I LIKE  
AND FEEL FINE

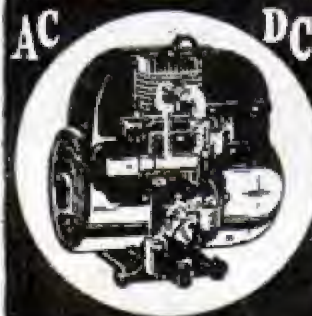
THEY SURE FIX  
MY ACID INDIGESTION,  
TOO. I ALWAYS  
CARRY TUMS AND  
NEVER SUFFER

## RELIEVES ACID INDIGESTION UNBELIEVABLY FAST

**YES, TUMS**, a remarkable, new discovery brings amazing quick relief from indigestion, heartburn, sour stomach, gas, and constant burning caused by excess acid. For TUMS work on the true basic principle. Act unbelievably fast to neutralize excess acid conditions. Acid pains are relieved almost at once. TUMS contain no laxatives; no harmful drugs. *Guaranteed to contain no soda.* Over 1½ billion TUMS already used—proving their amazing benefit. Try TUMS today. Only 10c for 12 TUMS at all druggists. Most economical relief. Chew like candy mints. Get a handy 10c roll today, or the three roll economy package with metal container for only 25c.



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Onan A.C. plants furnish same current as city lines, 110 Volt, 60 Cy. For farms, camps, construction jobs. Operate radios, water systems, all appliances. New models, 350 to 5000 watts, 6, 12, 32 and 110 volt D.C. Models \$57.50 and up. Also combination A.C.-D.C. units Shipped complete, ready to run.

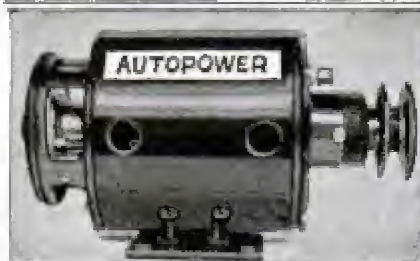
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1019 Royalston Ave.  
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## VENETIAN BLINDS

Make your own at low wholesale cost. It's easy under our unique plan. All materials supplied. Send 20c for circular and samples of Ladder Tape, Cord, Rails, Slats, 15 color samples of tape and chart listing most decorative color combinations

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AUTOPOWER tells you how in plain, easy, simple and illustrated instructions that anyone can follow. Change auto generators into useful, practical A.C. and D.C. generators and motors with voltage from 2 to 1,000 volts, for power, light, welding, radio, sound, etc. No previous experience nor special tools needed. Generators can be driven by wind, water, fan belt, etc. **INSTRUCTIONS FOR BUILDING AN A.C. WELDER THAT ACTUALLY WORKS UP TO A 3/16" ROD. ALSO COMPLETE PLANS FOR WIND AND WATER POWER PLANTS.** Send for your copy of "AUTOPOWER." Already used and endorsed by thousands. Only \$1.00 postpaid.  
**S. W. DUNCAN, Publisher.**  
410 S. Hoyne Ave., Chicago



## KILL RATS WITHOUT POISON

YOUR  
MONEY  
BACK  
IF RATS  
DON'T  
DIE



This rat-killer won't kill Live-stock, Pets or Poultry—Gets Rats Every Time. **K-R-O** is made from **Red Squill**, a raticide recommended by U.S. Dept. Agr. (Bul. 1533). Ready-Mixed, 35¢ and \$1.00; Powder, 75¢. All Druggists. Damage each rat does costs you \$200 a year. **K-R-O Company, Springfield, O.**

## K-R-O KILLS RATS ONLY



## PHOTO ENLARGEMENTS

Is Photography your hobby? Do you want a profitable easy business at home? Make **PHOTO ENLARGEMENTS** for yourself and others. Your cost 5c each and less. The Ideal Photo Enlarger is **AUTOMATIC**. No experience required. Also **COPIES** any picture, \$5.94 COMPLETE. Interesting circular **FREE**.

**5¢**  
ANY  
SIZE

IDEAL-O, 122 East 28th Street, New York City

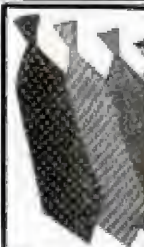
## BUILD THE CUTTY SARK!

10¢  
FOR  
COMPLETE  
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**KUEMPEL CHIME CLOCK CO.**  
Building 14 Guttenberg, Iowa



(Continued from page 130A)

our machines. A worn magneto chain climbed the sprocket teeth and broke. We made a new one out of emergency repair links. Another sidecar spring leaf broke. Our strap-iron supply was used up, so we sawed off a fender bracket and made a clamp. Then Flood's luggage carrier snapped in two. I had borax and brass rods, but no forge. Back in Nigeria I had used a pair of handlebars as a blowpipe. Now, with Flood for the bellows, and charcoal, which we could manufacture from dead trees in the cuvette, nothing was lacking but the firepot. I sawed an empty gas can in two, punched a hole in the bottom to receive the end of the handlebars, and lined my "firepot" with clay. With this improvised forge and a big rock for an anvil, we stuck that carrier together.

Three days later, the cap dropped off Flood's magneto breaker box, and a tiny fiber bearing fell out and was lost. The bike wouldn't run without it. On hands and knees we combed that desert for three hours, but it wasn't any use.

Flood had his face stepped on while playing college football and his four upper front teeth were mounted on a quick detachable partial plate.

"Flood," I said, "spit out that plate."

I touched a match to it, and the stuff began to melt. It was hard rubber, so I molded a bearing out of that partial plate that got us the rest of the way across Africa.

Slowly we were crawling toward our goal. But at Athi, Flood was stricken with violent shooting pains in his right side. For three days we kept him in cool wet packs. On the third morning the pains began to subside. Several months later, after we got home, the pains came again. That time, the doctors took out his appendix.

At Adre, last post in French territory, we told the commandant we had come from the west coast on our motorcycles but not until we had shown him our passports, signed by the authorities of every civil and military post, would he believe us. At last, El Fasher, capital of Darfur province of Anglo-Egyptian Sudan. White men who could speak English!

"It's 400 miles from here to El Obeid," said the governor of Darfur, "and absolutely the worst road in Africa. I'll give you a military escort and a truck."

(Continued to page 134A)

# MAKE YOUR PICTURES LIVE

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(Continued from page 133A)



## HOW A SIMPLE TRICK MAKES SHAVING EASY

● Blackstone, master magician, says: "Making whiskers disappear like magic is one of the easiest tricks on earth. Just slip a Gillette Blade in your Gillette Razor and—presto—you've got the closest, longest-lasting shave money can buy. Shave the Gillette way and your face *shows* the difference—looks cleaner and smoother for hours!"



● A few passes whisk away Blackstone's steel-gray stubble quickly and cleanly. You don't have to be a magician to duplicate this feat. Simply use a Gillette Blade in a Gillette Razor. You'll get the world's best shaves for *less than one cent a day*.

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PRECISION-MADE  
FOR EACH OTHER

# Gillette Blades

MORE SHAVING COMFORT FOR YOUR MONEY

"What!" gasped Flood, "has a truck been over the road?"

Four days later we were in El Obeid. The "worst road in Africa" had been the best trail we'd struck since leaving Zinder, almost three months before. From El Obeid to Khartoum there was a railroad. It was not made for motorcycles, but we took it.

And then the Nile, at last. There were the creaking water wheels of an irrigation system centuries old, and the two sleepy oxen endlessly plodding their rounds. And a few miles beyond, the great Sennar dam, which does the work of a million oxen.

We were passing from one world into another, and the transition was accompanied by bizarre and curious compromises. Two lumbering camels hitched up to a red-and-green farm wagon, labeled, "Made in Moline, Ill." A barefoot, turbaned native weighing cotton on a set of platform scales, in front of a grass hut. I felt like a man gradually awakening from a 2,000-year sleep. And then we sighted Khartoum, capital and metropolis of Anglo-Egyptian Sudan, shimmering in the heat a dozen miles ahead.

"We've made it!" I shouted to Flood.

Half an hour later we were there. There was mail, the first in four months. A real garage. And an Austrian dentist who could make Flood a new set of teeth. There were 700 Englishmen asking, "How did you do it?"—a question we couldn't answer, because the more we thought of it, the more incredible it seemed.

It's 400 miles from Khartoum to Massawa, on the Red Sea. First, 250 miles of desert and only three wells in the whole stretch. Then, Kassala, and the Italian frontier. Up and over the Red Sea hills on a good military road, and then—Massawa in the distance, and that blue sheet of water toward which we'd started almost five months before. Down the little main street of Massawa to the beach we drove our motorcycles and stood silently looking out over the water. "Well," said Flood, "we're here. What next?"

Five days later we shipped for India on a luxurious liner. Africa had taught us that no matter what happens, you're never licked as long as you've still got your tool kit and a pal to do the praying when the wrench slips.





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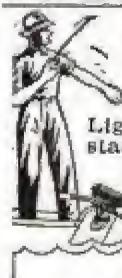
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IDEAL FOR BUSINESS OR PERSONAL USE: Adds, subtracts, multiplies, divides. Does work of more costly machines. Counts up to million, made of steel—weighs 8 ounces. Simple, accurate. Not a toy. Guaranteed 5 years.

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Order from ad, not sold in stores. Just send name and address, (in delivery pay postman \$2.50 plus 10 cents postage). (If outside U. S., send check.) The additional in Leatherette Case. If not satisfied after 14 days' trial you get your money back. Thousands of satisfied users. Write for Agent's proposition. **CALCULATOR MACHINE CO.** (Mfrs.) Dept. 105, P. O. Box 1118, Chicago, Illinois.

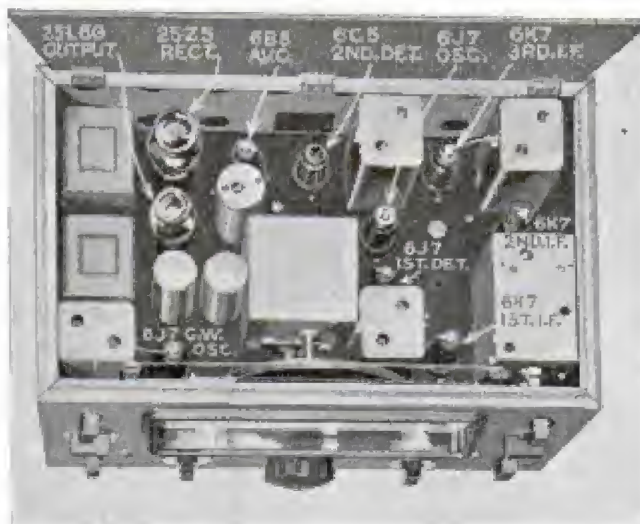
## Receiver of Advanced Design

(Continued from page 737)

In this case the receiver is fitted with a suitable cable and plug for making the connections.

Photos Figs. 1 and 2 show front views of the set, with the various controls plainly labeled. Fundamental design advances include an automatic plug-in coil system, indicated in bottom view, photo Fig. 3, which combines all of the desirable features of plug-in coils, and coil switching by means of the single range-selector knob on the front panel. A crystal filter provides continuously variable selectivity over a range of from 300 cycles to 7 kilocycles.

The tuning system is claimed to be an entirely new design and employs a multiple-scale dial of the full-vision type,



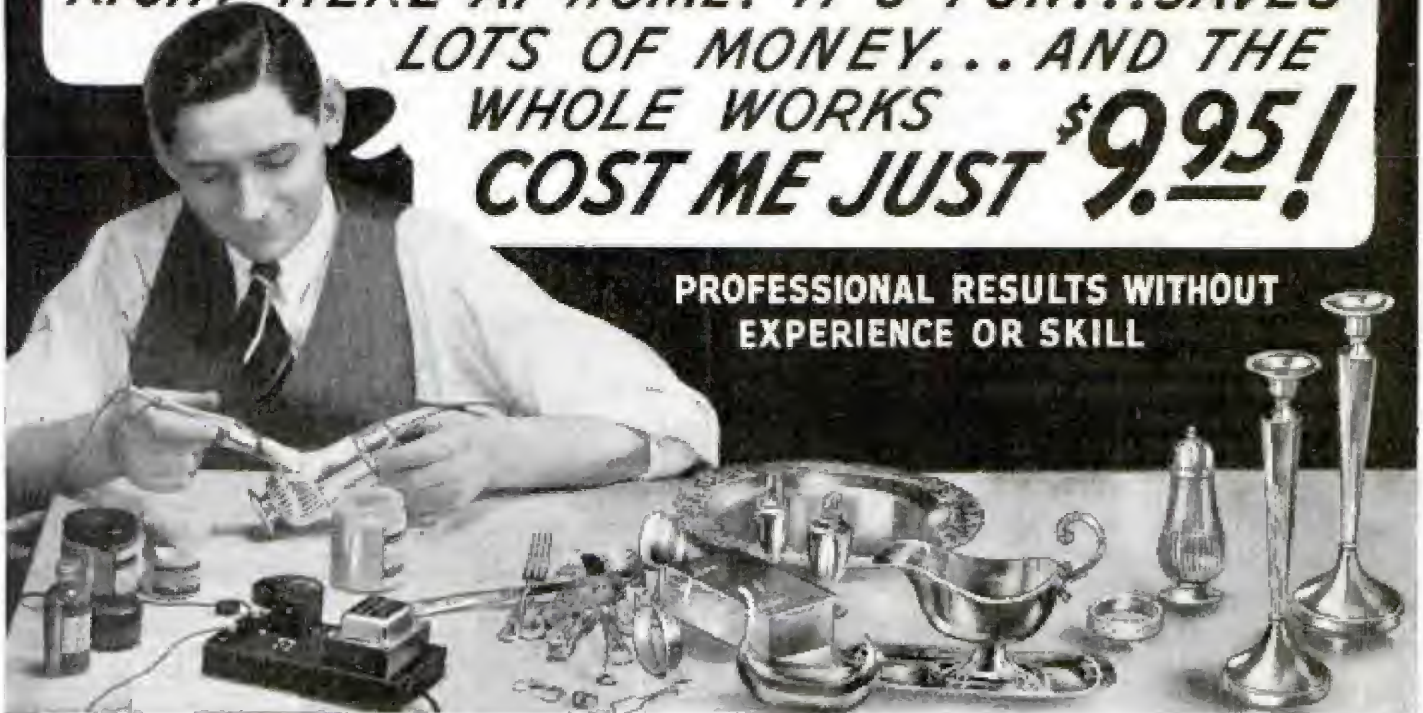
accurately calibrated in megacycles, a megacycle being 1,000 kilocycles. Several unusual features are incorporated, such as a mirror for overcoming parallax, an auxiliary linear scale numbered from 0 to 100, and six adjustable frequency markers by means of which any particular stations or frequencies may be "logged" on the dial itself. A dual vernier reduction drive is used which provides a 55 to 1 reduction over any narrow band of frequencies with automatic shift to an 11 to 1 reduction for conveniently and rapidly moving the pointer to another section of the scale.

Tests made with model NC-81X in Popular Mechanics radio laboratory, on both a.c. and d.c. operation, were satisfactory in every respect. A separate speaker is supplied in a small cabinet finished to match the receiver; a top view showing the tube arrangement appears in the photo above.



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**PROFESSIONAL RESULTS WITHOUT  
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● Look around your home and see how many articles you find that need plating. Silverware, lamps, appliances, plumbing fixtures, tools, toys, jewelry, kitchenware, auto equipment—an endless variety of things. **You can plate any and all of them, quickly and economically, with the new Portable Super Plater.** And we repeat, you do **not** need past experience or professional skill to do it. It's fascinating work which young and old will enjoy.

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The complete Super Plater Kit, including POWER UNIT, PLATING BRUSH WITH METAL ANODE, NICKEL, COPPER and SILVER PLASTIC PLATING SOLUTIONS, CLEANING SPONGE, CLEANING and POLISHING COMPOUNDS, and complete instructions, weighs only 7½ lbs. You take it to the job—in the basement, bathroom, garage—wherever there's an AC outlet. Plug in and you are ready for work. And you'll be amazed at the results. An hour or so of your time, plus a few cents electric current cost, will turn out professional jobs at a small fraction of the price you would normally pay. In fact, the Super Plater, with only average usage, will pay for itself in less than thirty days.

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The Super Plater has been tested and approved by industry. It is built and operated

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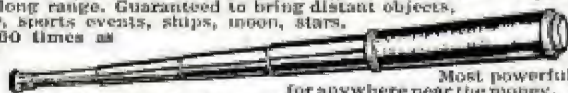
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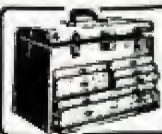
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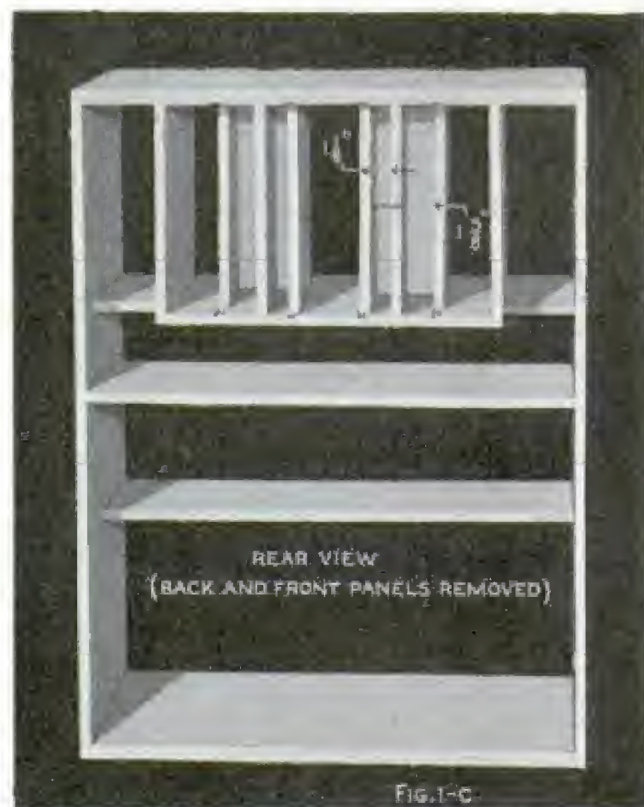
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**MEGOW'S** Dept. P.M., Howard & Oxford Sts., Phila., Pa., or 217 N. Desplaines St., Chicago, Ill.

## Homemade Speaker Cabinet

(Continued from page 741)

Approximately 32 square feet of ½-in. veneer panel, and 5½ feet of ¾-in. veneer panel are required. Begin construction by cutting out parts A to M according to the dimensions given in the cutting table. Partition H has two 4-in. squares cut out of the rear corners. Rabbet sides for partitions H, G and F; top of partition H is rabbeted for the labyrinth partitions, all rabbets being ⅛ in. in depth and width to take stock. Fig. 1 and photos Figs. 1-A, 1-B and 1-C show all details clearly. The speaker hole is centered 6¼ in. from the top of front panel A, for an 8-in. speaker. Round head No. 6 wood screws 1 in. long are used with washers to fasten front and back panels. Glue all partitions in their rabbets; sides can be clamped or temporarily held with nails until glue dries. Putty up nail holes and paint or finish as desired.



### CUTTING TABLE

Part	Name	Length	Width	Thickness	Required
A	Front	24¼"	27"	½"	1
B	Back	36"	27"	½"	1
C	Bottom	26¼"	15"	¾"	1
D	Top	26¼"	15"	¾"	1
E	Sides	36"	15"	½"	2
F	Partition	26¼"	9"	½"	1
G	Partition	26¼"	10⅝"	½"	1
H	Partition	26¼"	15"	½"	1
I	Partition	11¼"	12"	½"	2
J	Partition	11¼"	13"	½"	2
K	Partition	11¼"	6½"	½"	2
L	Partition	11¼"	7"	½"	2
M	Partition	11¼"	3⅞"	½"	2



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of Motorists

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To SAVE GAS?**

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The undersigned being duly sworn says:

**"5 MILES  
MORE PER  
GALLON"**

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Write for  
More Statements

The undersigned being duly sworn says:

**"8 MILES  
TO GALLON  
MORE"**

G. R. Marman, Pa.

The undersigned being duly sworn says:

**"4 TO 6  
MORE MILES  
TO GALLON"**

D. C. Brame, Ont.

JACK SMEAD

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IN GASOLINE" ON MOTOR TRIP SAN  
FRANCISCO to CHICAGO**

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Costs Nothing if it Does Not Save Gas

Yes, you may try this new improved gas economizer on your own car under our liberal 30-day trial offer—check your gas mileage BEFORE you install it. CHECK it again AFTER you install it—then, you be the judge, and if it does not save gas, save money for you, and you are willing to return it under our liberal guarantee within the 30-day trial period. It costs you nothing—but, that's not all, we will even pay you a bonus for testing it if not delighted—so, you can't lose. Without obligation, send name and address on coupon below—or paste on 1c postcard and mail NOW.

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E-751, Pukwana, So. Dak.

J. A. STRANSKY MFG. CO., E-751, Pukwana, So. Dak.

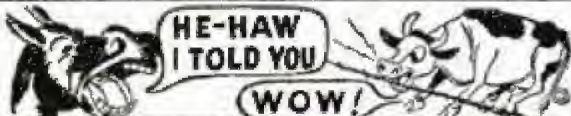
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making plan.



## FENCING COSTS SLASHED PARMAK ONE WIRE ELECTRIC FENCER now with AMAZING FLUX DIVERTER

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with one used barbed wire on light stakes—permanent or portable. PARMAK proven by use on thousands of farms—now PARMAK has Amazing New FLUX DIVERTER invention that increases efficiency—long service from SAFE 6 VOLT Batteries.



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Try on your farm before deciding. See huge saving in money, time, labor: see how it holds stock like steel and concrete. Write today for FREE CATALOG and long term guarantee. AGENTS—Business wanted. Revolutionary new Flux PARMAK more efficient, more economical, easier to sell. Be first in your locality—Write today.

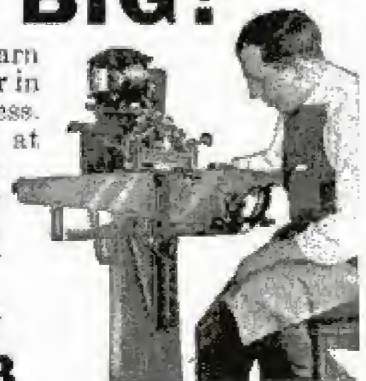
PARKER-McCRORY MFG. CO. Est. 1913  
100-E, 2609 Walnut St., Kansas City, Mo.

## Saw-Filing

### PAYS BIG!

An opportunity to earn up to \$2 to \$3 an hour in your own cash business. Start in spare time at home. No experience required. You can do expert work... easily, quickly, without eye-strain, with a

### FOLEY AUTOMATIC SAW FILER



"I have filed 765 saws in spare time and have earned \$850.00 in carpenter work due directly to my saw filing contacts," says Louis P. Wadowick, Ohio. "Am still operating my Foley Filer after 5 years. Business better than ever this year," writes J. W. Veith, Pa.

The Foley files ALL kinds of hand saws, band saws and crosscut circular saws BETTER than expert hand filing—every tooth exactly uniform in size.

FREE PLAN shows you how to start—no canvassing. Send coupon now—no obligation, no salesman will call.

FOLEY MANUFACTURING CO.  
516-8 Foley Bldg., 11 Main St., N.E., Minneapolis, Minn.

Send me FREE PLAN, for starting my own business in spare time filing saws on the Foley Automatic Saw Filer, without obligation to me.

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ADDRESS.....

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IN BUILDING INDUSTRY—with machine and process producing permanent construction with savings of 1/3 labor, 1/2 mortar, and 1/3 material costs—ashlar, hollow, veneer or solid walls—plain or 40 colors.

WE EQUIP YOU with Automatic Machinery—large production only one or two men. Equipment costs but fraction of other processes with equal capacity.

INVESTIGATE—let us show you why building today offers you the greatest opportunity for growth, expansion and profit in a business of your own, using raw materials available in your territory. Write today.

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600 West 24th St. Holland, Michigan



**A BARGAIN**Use it as a  
**Bench Grinder****The NEW UNIVERSAL GRINDER**

**COMBINES THE CONVENIENCE OF A BENCH GRINDER WITH THE ADAPTABILITY OF A HAND TOOL. OFFERED COMPLETE WITH 30 PIECE ARBOR TOOL SET AT THIS EXCEPTIONALLY LOW PRICE**

is an indispensable and convenient grinder for shop, model maker or professional man. High-speed, high-power motor develops 10,000 rev. per minute.

wide variety of uses. Compact design, equipped with 3 jaw universal arbor chuck, adjustable to use. Real fine cutters for work on delicate jobs and to eliminate tedious work hours.

speeds work, saves time, saves money. Arbor tool set enables you to grind, drill, route, split or carve. Operates on 110 volts A.C. or D.C. Variable speeds from 1,000 R. P. M. to 500 R. P. M. can be obtained with the use of a rheostat \$2.50 additional.

**INCLUDES 30 PIECE ARBOR TOOL SET**  
which consists of 10 assorted sizes of grindstones, assorted engraving or carving burrs, mounted point polishing buffs, screw mandrels, polishing brush and assorted sanding discs of emery, garnet, sand, fine, medium and coarse.

Rush \$1.00—Balance C. O. D.

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Used as a hand tool

**50 PIECE UNIVERSAL ARBOR TOOL SET 75c**

Indispensable to Jeweler, Laboratory, Model Maker and Home Craftsman. The ideal outfit for fine abrasive grinding, sanding, routing or carving. Includes 12 grindstones with brass centers in assorted sizes, 3 bachelite cut-off wheels, 5 assorted engraving, routing or carving burrs, 2 polishing buffs, 1 mounted point, 2 bristle polishing brushes, circular and cup shape, 3 mandrel arbors, 30 assorted sanding discs of emery, garnet, sand, fine, medium and coarse.

Send Coin or Money Order \* Shipment Prepaid  
**PHILADELPHIA MACHINERY CO., 118 N. 6th St., Phila., Pa.**

**FLAME-GUN Destroys Weeds****Does Work of 4 Men !**

Hauck Kerosene Flame-Gun—2000° F. controlled heat—quickly, easily, economically destroys weeds (weeds and all), brush, other objectionable growths. Keeps roadways, fences, irrigation ditches, orchards, etc., clean. Hundreds and one uses. Inexpensive—Safe—Easy to use. Pays for itself in time and money saved. 10 day Free Trial. Write for Free booklet and special introductory price.

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Does all field and belt work. Handles easily. Absolutely safe. Operates for 32¢ a day. Hundreds in use. Buy direct at low factory price. Two weeks trial—satisfaction guaranteed. Write for your free colorful catalog.

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MAKE PERFUMES. "Per-Chem" Set including 14 real perfume chemicals, apparatus, full course of instructions—\$3.95. At your local store or direct from us, postage prepaid, on receipt of price. Or 30 page book giving directions for making 30 popular scents and list of chemicals required.—25c. **Per-Chem Co., Wilmington, Del.**

**WRITE** for this big  
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**Women ARE GOING WILD ABOUT THIS NEW WRIST-ACTION CORD!**

Here is no ordinary new product. This new Wrist-Action Plug is one of the most remarkable new devices ever offered in the Direct Selling Field! You never saw anything like it. Housewives are fascinated—held spellbound by the instant demonstration you can give with this new electric iron cord that swings freely in any direction. Ends kinking and twisting—prevents broken wires, burned fuses. Swivel action plug spins round and round—swings from side to side—keeps cord out of the way—no wonder housewives say "Just what I want," as soon as they lay eyes on it!

**FREE** Sales are instant—sure! Nothing like it ever before. Here is the self selling big money maker you can clean up with. Get the story at once. Learn how you can **GET YOUR DEMONSTRATOR FREE**. All territories virgin—wide open. Write immediately for sensational money making plan.

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When writing please mention Popular Mechanics

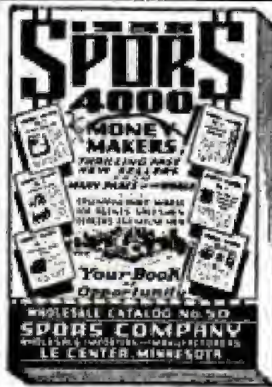
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Patents**90 DAYS  
FREE TRIAL**

U. S. BUREAU OF STANDARDS (Bul. 86) States:  
**"Oil Does Not Wear Out Mechanically"**  
**THEN WHY WASTE YOUR MONEY**

on Frequent Oil Changes  
and Preventable Motor Wear—

when "RECLAIMO" The Super Filter Refiner constantly maintains perfect lubrication on all types of autos, trucks, tractors and diesels. Attached like any oil filter "Reclamo" removes solids by filtration, gasoline dilution, water, corrosive acids through indirect use of exhaust heat—KEEPING THE OIL CLEAN AND OILY BY AN ENTIRELY NEW PROCESS.

**THOUSANDS OF ENTHUSIASTIC OWNERS** Read some of their remarkable statements in our **FREE BOOKLET—"Oil Facts"**—tells you all about oil and may save you a lot of money—sent free with 90-Day Trial Offer. Write today.  
**RECLAIMO MFG. CO., 2306 N. Western Ave., Dept. D, Chicago**

**FREE! WHOLESALE CATALOG**

Has: 15 selling plans; 30 money making ideas; 4000 world wide bargains; 260 pages of big values. Also shows top-notch prizes; business stimulators. All at rock bottom wholesale prices. Obtain this fascinating Book Of Opportunity, **FREE**. Write for it today, to

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For Store Fronts and Office Windows. Anyone can put them on. Free samples. Liberal Offer to general agents.  
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**FREE 48-Page POWER TOOL Catalog** sent to any home craftsman interested in improving his work. Full descriptions of **DRIVER Engineered Power Tools and Accessories**. Write today!  
**Walker-Turner Co., Inc., 158 South Avenue, Plainfield, N. J.**

**DRIVER Engineered POWER TOOLS**

**FREE ELECTRICITY** • • •  
From Wind. Build your own windcharger. Cost 98¢ for material plus used car generator. Send 10¢ for copyright drawings, instructions today.  
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**STRIPE YOUR OWN CAR**

Anyone can stripe a car with an automatic ROLL-A-STRIPE. You can save the price of your striping job and earn money doing others. Specially knurled roller and dependable gauge. Paint, lacquer, enamel or varnish may be used. Stripe signs, furniture, models, etc. See any Drive Dealer today or send direct. Postpaid \$1.00.

**MODCRAFT INDUSTRIES, Dept. P-45, 2908 N. Nordica Ave., CHICAGO, ILL.****WET BASEMENTS!**

Amazing new Seal-Seep method, anyone can use. Applied to inner masonry wall and floor surfaces; no digging. Guaranteed permanently effective. Agents write for unusual earnings opportunity. Details **FREE**.

**National Seal-Seep Co., Dept. 592, Cincinnati, O.**

**Waterproof Your Own**  
**Save up to \$100 to \$150**



## Flagships of the Gold Fleet

(Continued from page 733)

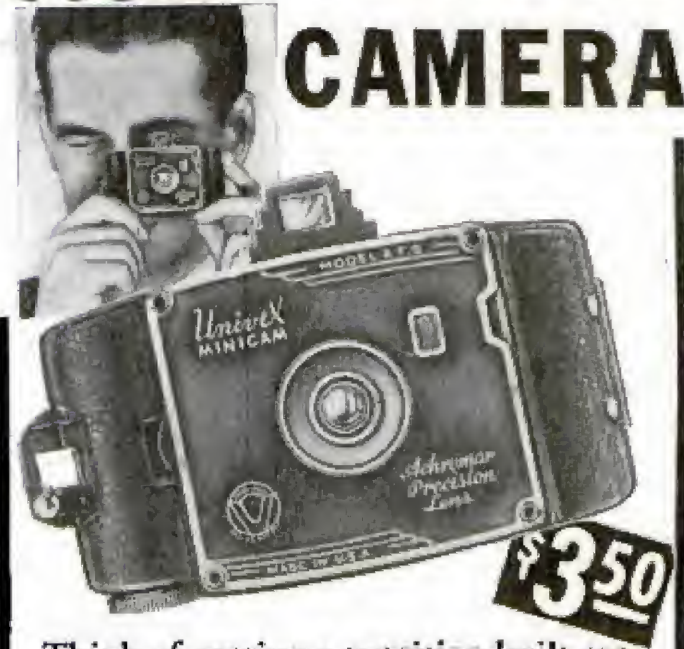
steel legs, a "digging spud" normally driven deep into the ground under the boat to provide a pivot on which the dredge swings, and a "stepping spud" by which the boat can be moved ahead in eight-foot steps whenever the bucket ladder has brought up all the material within reach. Heavy steel cables leading to anchorages on the banks of the lake are used for swinging the boat to and fro.

The "Natomas No. 1" picks up 605 cubic yards of material every hour, almost 15,000 cubic yards in a twenty-four-hour day. In a year's time the boat will scoop up about five million cubic yards of gravel and earth. To get through a schedule like this hardly any time can be allowed for possible breakdowns and all of the boat's machinery and equipment is constructed for the utmost durability and reliability. Operations are hardly ever stopped except for the weekly clean-up. The parent company maintains huge machine shops, forges and electrical shops adjacent to its fleet of boats so that repairs can be started at once if a breakdown does occur.

Instead of being launched like ordinary vessels, gold boats have to be assembled at the sites at which they will operate. First a dragline scoops out a hole a few feet deeper than the draft of the boat and 200 feet square. Next the hull is assembled in the hole, water is admitted to float the hull, and then the superstructure, digging ladder, and the rest of the gear are installed on board. Depending upon the depth being dug, one of the boats may dredge twenty acres or more during a year.

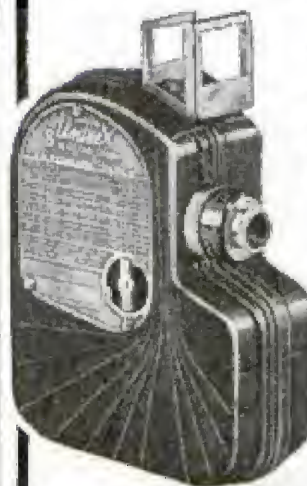
Gold is by no means the only metal recovered by the dredges in California. Tiny flakes of platinum, including osmium, iridium and other associated metals, are saved by the riffles. A thousand dollars worth of platinum may be gathered by one dredge in a year's time. In some localities small but perfect diamonds are found occasionally. Gold, silver, and copper coins are recovered, some being of modern coinage while others date back to the days of '49 and earlier. Old silver coins are cut up and used in assay work. Lead is the largest by-product, one dredge alone usually collecting 500 pounds of this heavy metal every year.

## NEW CANDID CAMERA



Think of getting a precision-built candid camera—so fast you can "stop action" instantly on hundreds of difficult subjects—at the sensational price of only \$3.50! Uses inexpensive UniveX Ultrachrome 10¢ roll film; or the new, faster panchromatic UniveX Ultrapan at 15¢.

## AMERICA'S No. 1 MOVIE CAMERA



The UniveX Cine "8" is the only 8 mm. movie camera under \$30...the only one in the world that takes movies at less cost than snapshots!

- Uses 60¢ Film
- Easy to load and operate
- Lenses interchangeable
- Written Guarantee

**\$9.95**

With F:3.5 Lens - \$19.95

Prices Higher in Foreign Countries

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Dept. 55, 32 W. 23rd St., N. Y.

Send me the free booklet checked below

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☐ UniveX Cine "8"

Name \_\_\_\_\_

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**FREE BOOKLET**



# \$190<sup>00</sup> in 8 DAYS STUCCO SPRAYING



Philip J. Herzberger writes:

Thought you would like to know how I am getting along. Well, my first house was colored with Stucco and this job brought me three years' income in Stucco which I did in eight days, putting me a credit of \$190.00 and now I have three houses and a house-boat colored in Stucco.

**COLORCRETE  
MAKES NEW OR  
OLD BUILDINGS  
MORE ATTRAC-  
TIVE and waterproof.**

It fuses with any masonry surface. It fills all cracks and can be sprayed in any thickness and in 30 colors. Fully proven by over twelve years actual use under all conditions and every climate. OFFERS BIG EARNINGS. Operators report costs of 2c and up per sq. ft. and sell up to 7c. Some have paid for their equipment from first few jobs. Machine capacity up to 1,000 sq. ft. per hour. GET THE FACTS. Send for COLORCRETE Book "Proven Business Opportunity." Write today.



**COLORCRETE INDUSTRIES, INC.**  
570 Ottawa Ave., Holland, Mich.

## BUILD THESE Novel BIRDHOUSES



**WELCOME YOUR BIRD FRIENDS**  
Make spare time pleasant and profitable—beautify your garden.

Martin House  
M15 Unique  
Tower Style  
12-family  
size . . . \$0.75

### SPECIAL BLUEPRINT VALUE

Birdhouse Group—No. BH5—plans for 2  
Wren Houses, 1 Woodpeck-  
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Send 10c for new illustrated 32-page  
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## NEW, BIG, FULL SIZE ADDING MACHINE

Amazing invention! Sen-  
sational Add-O-Matic  
Adding Machine retails at  
only \$9.95 complete. Adds,  
multiplies, subtracts, di-  
vides. Does everything the  
expensive machines do. A  
big, sturdy, well con-  
structed machine for life-  
time service. Needed by re-  
tailers, professional men, etc.,  
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Visible totals. Quick—easy—accurate. AGENTS—biggest money maker  
in years! Take orders everywhere for first efficient, full size adding  
machine at LOW PRICE. Sells quick on simple demonstration.

**ADD-O-MATIC CO., Dept. B-9, 430 N. Oakley Blvd., Chicago, Ill.**



Only  
**\$9.95**  
COMPLETE!

**POWERAY**  
New, powerful 6-volt electric lan-  
tern. 80-100 hours light. 700 ft. beam.  
Unbreakable lens. 4 1/2 in. reflector.

Buy  
ONE OF THESE  
**"BIG  
LITE"  
DELTAS**

**POWERLITE**  
6-volt, Deluxe electric lantern. 800 ft. beam.  
80 to 100 hours light. 2 reflectors, front, spot  
beam; top, floodlight. Unbreakable lens. At  
sport, electrical and hardware dealers. At  
**DELTA ELECTRIC COMPANY**  
Marion, Indiana, Dept. 300

## How Clippers Dodge Storms

(Continued from page 677)

route from Guam to China. So ably can the meteorologists gauge the weather that their estimates of flight time are always within one hour of the actual time made by a clipper and often the clippers land within a few minutes of the time predicted for their arrival.

With all of its storms, weather over the broad Pacific is not so difficult to follow and predict as weather over land areas. This helps to make up for the great distances that are covered in the forecasts. Lack of terrain to create friction and absence of the vertical turbulences characteristic of mountainous areas permit storms to follow more or less natural courses, allowing forecasts of extreme accuracy. The meteorological departments draw two maps per day of the Pacific, checking up on their own forecasts by weather reports sent in from ships at sea.

Simply as a safety factor, the clippers have flown thousands of gallons of excess fuel back and forth across the Pacific. This is because of the slight possibility that unanticipated weather changes might keep the flying boats in the air longer than expected. A clipper always carries enough fuel for the expected flight time plus a reserve for another six hours. If the weather analysis for the long hop to Honolulu shows that a flight would require longer than twenty-three and one-half hours to complete, the trip is postponed until the weather improves. Finally, if a captain gets half way across and finds that he has used half of his fuel, his instructions are to turn around and go back. The head wind that has run up his fuel consumption then will be on his tail and he returns in a hurry.

Pan American draws the information for making its maps and forecasts by fast radio service from about 400 different reporting stations. It maintains fifteen completely equipped meteorological depots on the Pacific and receives data from some sixty stations in the Orient, even the weather in Siberia having an important effect upon future conditions over the ocean. Weather in eastern United States also may have some effect and has to be considered even though the normal weather trend runs from west to east. An average of thirty

(Continued to page 144A)



## WORLD'S GREATEST *all around* ELECTRIC TOOL

**DRILLS, GRINDS, SHARPENS  
SANDS—SAWS—POLISHES, etc.**

The new WHIZ ELECTRIC TOOL is the handiest, most useful power tool ever made. Not a delicate instrument but a real rugged tool, equally effective for both power and precision work. Drills through 1/4 inch iron plate in 40 seconds, engraves intricate designs in jewelry and does 1001 other jobs. Handles any material: Metals—Woods—Alloys—Plastics—Glass—Steel—etc. Saves time. Eliminates tedious labor. Plug into any socket AC or DC, 110 Volts. Chuck 1/2" capacity. Ball bearing thrust. Powered, triple-gear motor. "Worth its weight in gold!"

**STANDARD MODEL** with Normal Speed (uses 50 different accessories, instantly interchangeable) only \$6.95. **FREE** Accessory outfit (Value \$2) includes set of drills, mounted 1 1/4" grinder, sanding discs, cutting wheels, mounted brush, polishing wheel, etc. **FREE** with each outfit ordered NOW. We pay postage on all shipments. Will send C.O.D. if desired. 10 DAY TRIAL.—**MONEY BACK GUARANTEE.**

Special "3-SPEED" MODEL combines Normal Speed and High Speed in one outfit (uses 200 accessories) only \$8.95 complete, including above accessories and carrying bag **FREE.**  
**PARAMOUNT PROD. CO., Dept. 5-A, 48 W. 48th St., New York**

**Sell  
SHIRTS  
for BIG  
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**FULL YEAR GUARANTEE  
MAKES EASY SALES!!**

Cash Commissions Daily. Cash Bonuses Regularly. Biggest and finest line, Dress Shirts, Sport Shirts, Ties, Hosiery, Underwear, all guaranteed for customers' satisfaction. We Pay Postage. Complete Sales Outfit **FREE.** Write TODAY.

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## USE ELECTRIC FENCING ... BUT BE SURE IT'S THE *Genuine* ONE-WIRE!

Out fencing costs 80 per cent with 6 volt battery or power operated ONE-WIRE Fencers. **FREE** booklet explains complete line of **ECONOMICAL, SAFE and EFFECTIVE** Fencers offered by oldest established company. Send postcard for valuable free Fencing Booklet. Includes full information on 3-Year Guarantee and Lloyd's Insurance policy. 30-day trial... Responsible Distributors invited. One-Wire Fence Co. Dept. 117, Whitewater, Wisconsin



## LEJAY WELDER Now Only \$1.00



\$1.50 foreign Postpaid

Complete kit of parts for making our genuine Lejay Welder which has proved such a sensation. Thousands sold to satisfied customers at \$2.50 each. Lejay now offers this famous tool in kit form at a saving of \$1.50. Easy to assemble—no other parts needed. Operates on car battery. Intense heat welds most metals.

Your first repair job will more than pay the small amount you spend for this amazing tool. Send \$1.00 for your welder today. Satisfaction guaranteed or money refunded. We also ship C. O. D.

**LEJAY MFG. CO., 347 LEJAY BLDG.,**

**Minneapolis, Minn.**

In answering advertisements always write name and full address clearly.

## DIESELECTRIC PLANTS

**"A CHILD CAN  
START IT"**

### ELECTRIC STARTING AND REMOTE CONTROL

Make your own electricity with Witte "Finger Tip Control," Vertical Dielectric Plant. Start and stop at the engine or from a remote point. Produce 1500 or 2500 watts on cheap non-explosive fuel, for less than 1c per kilowatt, or use plant for stand-by. 110 volt A. C. or D. C. for direct lighting, 32 volt for battery charging. Easily installed in small space. The WITTE Stationary Diesel Engine with its fewer parts is a marvel of simplicity. Sturdy, compact and always ready to deliver full steady power. 4, 6, and 12 H-P. sizes.

**Do it Safer and More Economical the "Diesel Way"**

**4745 Oakland Ave., Kansas City, Mo.**

## FREE TRIAL OFFER

**NEW REMINGTON NOISELESS PORTABLE**

**AS LOW AS**

**10¢  
A DAY**



**FAMOUS** Remington Noiseless Portable that speaks in a whisper, as

little as 10c a day. Standard Keyboard. Automatic ribbon reverse. Variable line spacer and all the conveniences of the finest portable ever built. **PLUS** the **NOISELESS** feature. Act now. Send coupon TODAY for details.

**You don't RISK a Penny.** We send you a Remington Noiseless Portable for 10 days' free trial. If not satisfied send it back. We pay all shipping charges.

**Typing course and carrying case.** You will receive **FREE** a complete simplified home course in Touch Typing. Also, a handsome, sturdy carrying case. No obligation. Mail coupon for full details—**NOW.**

**Remington Rand Inc., Dept. 152-5  
465 Washington St., Buffalo N. Y.**

Tell me, without obligation, how to get a Free Trial of a new Remington Noiseless Portable, including Carrying Case and Free Typing Course for as little as 10c a day. Send Catalogue.

Name.....

Address.....

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Send for  
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**Folding  
Puncture Proof  
Canvas Boats**

Light, easy to handle, no leaks or repairs; carry by hand and on auto; safe for family; all sizes; non-sinkable, stronger than wood; used by U. S. and foreign governments. Awarded First Prize at Chicago and St. Louis World's Fairs. Catalog.

**KALAMAZOO CANVAS BOAT CO.  
450 Harrison Street Kalamazoo, Michigan**

**J.C.M. SHOES  
WILL NOT  
RIP**



## AIR-CUSHIONED VENTILATED SHOES

Our unique "BEARDED" demonstrator has cords hanging from soles to show how soles are made, and how Goodyear stitches are locked through cords. Gets instant attention of everybody. Brings orders thick and fast.

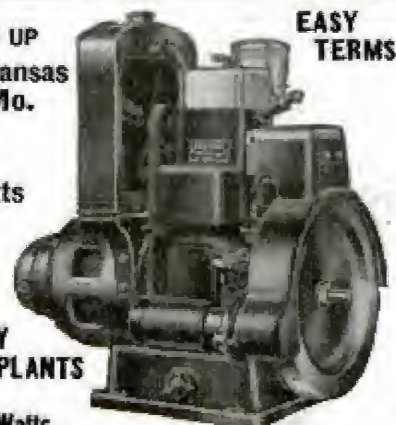


**SALESMEN WANTED**

**FREE SHOES TO PRODUCERS**

To use as samples. Commissions \$1.00 to \$2.00 on every order gives **IMMEDIATE** cash earnings up to \$35.00 to \$50.00 in a week—space or full time. Write TODAY! **J. C. MOENCH SHOE COMPANY  
Dept. P-5 BOSTON, MASS.**

**200  
STYLES  
FOR WHOLE  
FAMILY**



**EASY  
TERMS**

**\$760.00 UP  
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**Electric  
Starting  
2500 Watts**

**A.C.  
or  
D.C.**

**MANUALLY  
STARTED PLANTS  
1500-2500  
4000, 6000 Watts**

**WITTE ENGINE WORKS**



(Continued from page 142A)

## OLD KING COLE WAS A SOUR OLD SOUL!



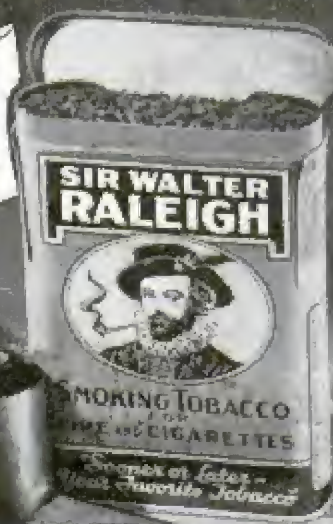
**HIS STINKO PIPE MIXTURE** knocked out everyone but the court jester, who pleaded: "Just clean that pipe of yours and switch to the Brand of Grand Aroma."



"**IT DOES SMELL GOOD!**" the king agreed, after he puffed those mild, ripe burleys in Sir Walter. "Give this man half my kingdom, and get me another 2-oz. tin!"

UNION MADE

**SWITCH TO THE  
BRAND OF  
GRAND AROMA**



**HOW TO  
TAKE CARE  
of  
YOUR PIPE**

**FREE BOOKLET** tells how to make your old pipe taste better, sweeter; how to break in a new pipe. Write for your copy today. Brown & Williamson Tobacco Corporation, Louisville, Kentucky. Dept. P-85.

**TUNE IN** Tommy Dorsey and his orchestra. Every Wednesday, 8:30-9:00 P. M., E. S. T., coast-to-coast NBC Red Network.

ships at sea report their local weather, two of the Matson liners on the Pacific conducting three upper air balloon runs every day and reporting wind directions and velocities at different altitudes. Radio reports from other ships consist of surface observations. In addition to all this, radioed weather reports from the clippers themselves are used for checking and correcting the maps.

Typhoons have been the bane of mariners ever since the oceans were first sailed, but instead of dreading them the captains of the clippers often welcome these violent circular storms. They offer no hazard to airway operation because they are so small in area that the fast flying boats can skirt them without trouble. Often a typhoon on the route simply means that a clipper will make better time than it would in still air. North of the equator the winds revolving around these storms move counterclockwise, so a westbound clipper sets a course to pass to the north of the storm center and thus gets a favorable tail wind. Bound east, the clipper flies south of the center and is boosted along by the same wind, which by now has circled the storm center and is traveling in the opposite direction.

For the past year Pan American has maintained a staff of forecasters scattered through the south Pacific, drawing weather maps and making forecasts in preparation for the projected airway from San Francisco to Australia.

South of the equator storms normally travel toward the southeast instead of toward the northeast and the circulation of wind around the storm centers is reversed from those in the northern hemisphere. Not a great deal has been known about the details of equatorial weather in the past. The present work is in the nature of valuable research and is leading toward real understanding of the formation of tropical air masses and of the formation and movement of typhoons. Eventually, this ocean meteorology work is going to contribute to the knowledge of world weather.

Popular Mechanics Magazine can furnish the name and address of the maker of, or dealer in, any article described in its pages. If you wish this information, write to the Bureau of Information, inclosing a stamped, self-addressed envelope.



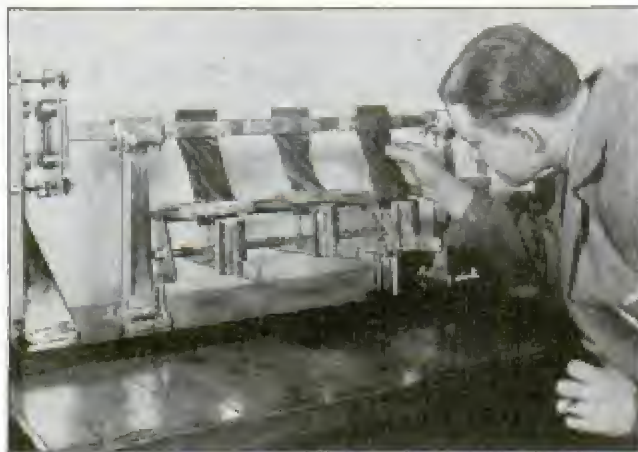




# Phantom Fleet of the Highway

(Continued from page 661)

ures with perhaps a suggestion or two for minor changes or adjustments. The first day's run was over smooth pavement. The second day the hell drivers begin pounding gravel. They swing into Minnesota,



*This flexing machine subjects fabrics and leathers for upholstery to violent twisting*

then into Canada, hammer over dry, dusty roads to Medicine Hat, then tackle the twisting, hilly highways to Banff.

Before they hit Spokane and Seattle, they know what the phantom fleet will do in the mountains. Then they sweep through Oregon and Idaho, across the desert to Salt Lake City and on to Cheyenne. Next they try the high Rockies.

Three weeks after the glistening caravan of cars rolled through the factory gates, the mud-spattered, travel-stained fleet glides back into Detroit with more than 8,000 miles on the speedometers. The test crew climbs wearily out, there's a hasty check-up of the cars, and six fresh hell drivers climb in. The caravan is off again, this time headed for St. Louis.

From there they zigzag into Kansas, Texas and Oklahoma, searching for the worst gravel, dirt and stone highways the section has to offer. Then the cars careen through Colorado, New Mexico and Arizona. Possibly the hell drivers head for the rocky wastes and sullen heat of Death Valley and reach the Golden Gate.

But wherever they may be each evening, long, detailed messages flow back to the plant in Detroit and lights burn all night in the engineering department as last minute refinements are made as a result of the information from the test crews. Another three weeks and the second group of

drivers is home. Speedometers of the phantom cars now read 16,000 miles. But there's no breathing spell for the cars. A third crew heads south and perhaps reaches Mexico City before it turns back.

And so it goes, day after day, week after week. Steady, merciless pounding over good roads and bad, building up mileage until the speedometers click off 25,000 miles, equal to the distance around the world. Then the cars come home to be dismantled. Parts are examined and measured carefully for wear.

Still, the job is only half done. Once in production, the first cars off the assembly line are hustled out on the highway for another 25,000 miles. Perhaps some minor point has been overlooked the first time. Or perhaps someone wants a super-test for some particular unit of the car. If so, the hell drivers know where to go.

Mississippi's dust is ideal for road-testing oil filters, shock-absorber seals and the dustproofing of body interiors. If it's brakes, the mountains of Pennsylvania will tell the story, while Arizona is the place to test radiation. Colorado is the proving ground for a vacuum clutch, and



*Testing carburetor and air cleaner to determine most economical fuel mixture*

to give steering gear "the works," the crews head for the twisting roads in some parts of North Carolina and Tennessee.

And long before you see the first new model, it has received the stamp of approval of the first fellow to sit behind its steering wheel—the "hell driver."

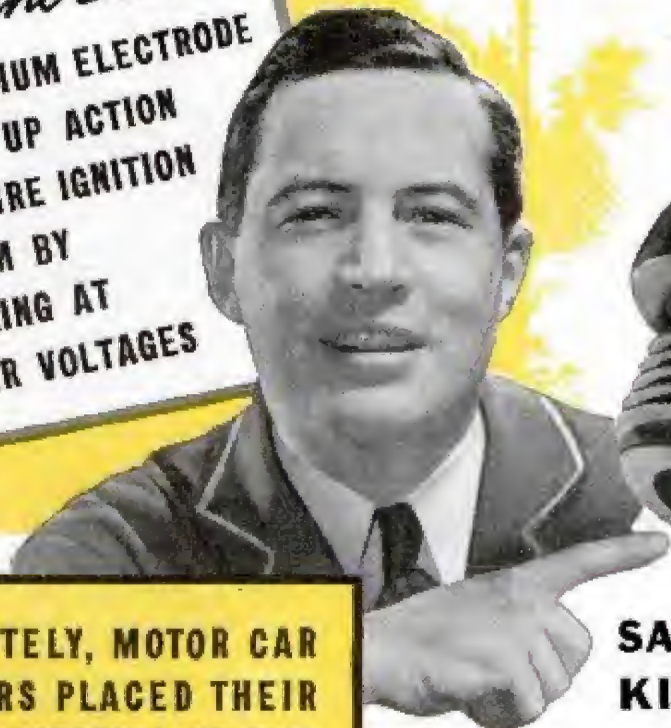
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## With New FAST ACTION AUTO-LITE SPARK PLUGS

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LOWER VOLTAGES



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ENGINEERS PLACED THEIR  
STAMP OF APPROVAL ON THIS  
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FOR 26 years the engineers of Electric Auto-Lite have specialized in starting, lighting and ignition equipment for motor cars.

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## THE BIGGEST HANDFUL in Radio History!



The  
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**ALL-AMERICAN FENCERS GUILD**

Dept. 5PM

48 West 48th St., New York, N. Y.

## Portable Hearing Aid

(Continued from page 739)

one 8-ohm winding and one of 7,000 ohms; see diagrams Figs. 2 and 3. To identify the windings in case your transformer does not have the colored leads, connect the pilot-light bulb and two No. 6 dry cells in series and complete the circuit through

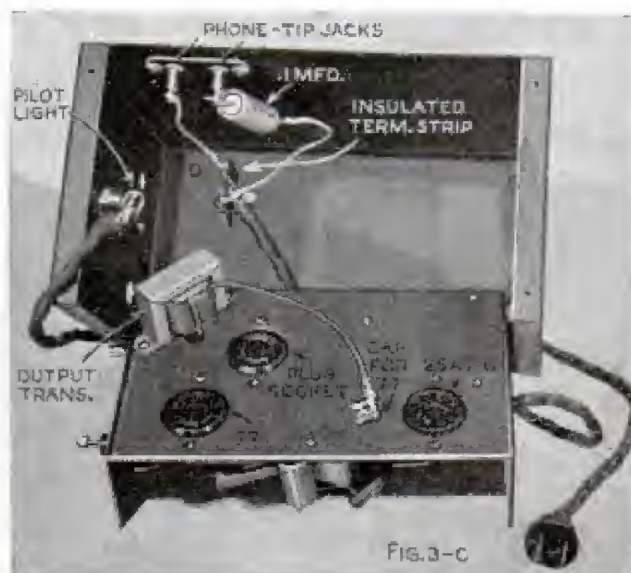


FIG. 3-C

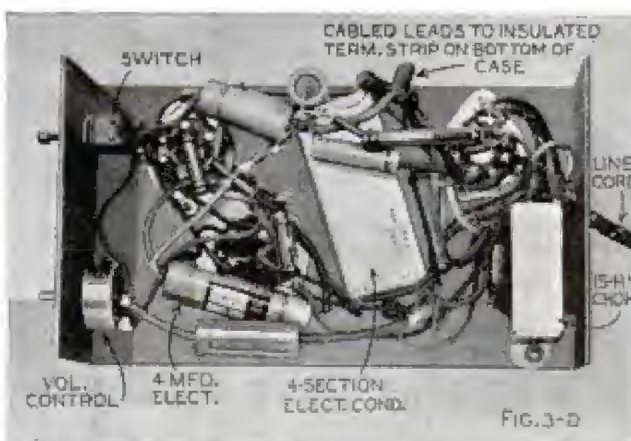


FIG. 3-D

each winding. The 8-ohm winding will light the bulb and the 7,000-ohm winding will not.

All case and base details are shown in Fig. 1; these cases are available formed and ready for drilling, if desired. A list of the original materials used can be obtained from Popular Mechanics radio department without charge. The blueprint number is R-253. Photos Figs. 3-A, 3-B, 3-C and 3-D show the assembly details, and every connection above and below the base is clearly indicated in the simplified wiring diagram Fig. 3. The floating ground eliminates the possibility of shock if the person using the unit touches the metal cabinet and an external ground at the same time.



## Surveying by Photography

(Continued from page 642)

such manner as to make it appear as though he were actually looking down upon the area from an airplane. The relief of the hills and valleys is reproduced perfectly. No important feature is concealed.

The various instruments provide the operator with a pointer which, by optical means, is made to appear as if it moved around in space over this view of the ground. The operator can move this pointer back and forth or up and down by manipulating the controls of his instrument. The instrument at the same time records upon paper the position of the pointer. All the operator needs to do, therefore, is to guide the pointer around over the features he wishes to map and a pencil automatically traces, on the scale of the map, the route followed by the pointer in outlining features to be mapped. One of these machines, called a multiplex projector, is capable of producing results at a greater rate, per square mile, than any of the other types, because several operators can work with it at the same time. As many operators as can be seated around the instrument, each using his own pointer, can be drawing at the same time parts of the map from the optical relief model visible to them all. Other instruments popularly in use are the aerocartograph and the stereoplanigraph.

The use of photographs does not liberate entirely the map maker from the necessity of some ground surveys. Before the photographs from the air can be used to fill in the details of the finished map they must be located with respect to absolute position and altitude. A few points on the ground must be located on foot so as to locate a few points which will show in the pictures and fix them in position.

A good example of how photogrammetry saves time and labor is the survey of unmapped regions of Alaska now being conducted by the geological survey. Here only 314,400 square miles of a total area of 586,400 square miles have been surveyed. This represents fifty years of labor with pack horses and dog teams. Some of this unsurveyed land is so wild and desolate that it is doubtful if a human being has ever visited it. Planes are at work over this virgin northland and it is only a matter of time until the whole of Alaska will have been conquered.



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6" (1 1/2" hole) .....	\$2.70	8" (1 1/2" hole) .....	\$3.50
7" (3/4" hole) .....	\$3.10	10" (3/4" hole) .....	\$4.50

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6" (1 1/2" hole) .....	\$4.30	8" (1 1/2" hole) .....	\$5.40
7" (3/4" hole) .....	\$4.00	10" (3/4" hole) .....	\$6.90

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**CENTER FINDER**

**SQUARE**

**PROTRACTOR**

**CIRCLE DIVIDER**



## Turning Night into Day

(Continued from page 725)

to be sure illumination everywhere is up to standard. For baseball the infield is lighted to twenty-five footcandles, while the outfield gets thirteen to sixteen. Automobile racing demands twenty-one footcandles on the entire track. That's about four times as bright as the average home. Down lighting only is used, and both straightaway and curves are lighted from behind the drivers, so they never have to face a glare.

In tennis, the speed of play and small size of the ball require intense illumination, all downward. Lacrosse is similarly exacting. The playing field, measuring 80 by 172 feet, is walled in with wire screens twelve feet high. Electricians string an overhead latticework of cables from which are hung dozens of brilliant 1,500-watt floodlights, pointing straight down. The playing field thus is one brilliant rectangle upon an entirely dark field where players can be seen clearly darting to and fro.

Auto racing is the most exacting of all sports in its demands. Imagine what would happen if the lights suddenly went out during a contest! But the "juicers" behind scenes are prepared. Through the stadium's own sub-station, a 900-ampere current constantly pours into the huge battery of incandescents. Cables bring power from two separate lines belonging to entirely different power companies. A magnetized relay, cut into the line at all times when the lights are in use, stands by for emergency. Should the power go off, a powerful impulse automatically throws the big relay levers across and switches over to the other company's lines so fast that you can't even see the lights blink.

Drivers in the midget auto races say they like night competitions better because the light is uniform and the sun never gets in their eyes. At dusk the track is watered down to exactly the right consistency. Since there is no sun to draw out the moisture, the dirt remains in perfect shape for fast driving. The tiny cars make work for the technicians, though. One man has to spend all his time keeping the lights in mechanical shape, cleaning, polishing, and adjusting. The put-put of the exhausts leaves behind an oily film on the lenses that absorbs much light. Three races cut down lighting efficiency by twenty per cent.



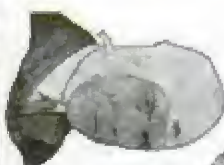
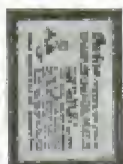
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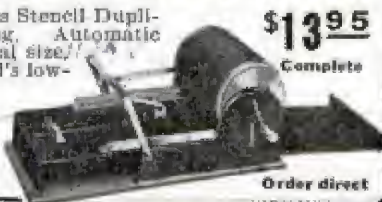


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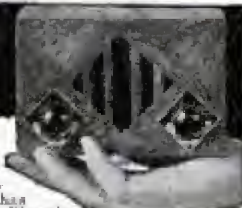
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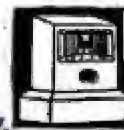
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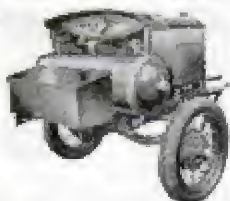
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## Life Saving Inventions

(Continued from page 701)

tries. Ranging in size from the portable devices used by utility workers in testing manholes for leaking gases to the large automatic mechanisms that determine, record and control the carbon-monoxide fumes in great plants, these devices have a wide application.

When a refinery worker has an assignment to go into a bulk storage tank to do some welding he wants to be certain it has been sufficiently purged of gases to make the job safe. If he's smart, he runs a sampling line of a combustible gas indicator into the tank. In a jiffy he knows if it is safe for him to enter. Another type detector, known as the Hoolamite, used in checking for the deadly carbon monoxide, makes accurate tests in ten seconds, even when there are fumes, smoke, and other gases in the atmosphere. This detector has come out of the chemistry laboratory. Essentially, it is a small tube filled with granules of an inert, white solid substance impregnated with iodine pentoxide and fuming sulphuric acid, and connected through a small receptacle filled with gas purifying material to a rubber hand bulb aspirator. Any carbon monoxide in the air drawn through the detector reacts with the iodine pentoxide to form carbon dioxide, and liberates free iodine. The liberated iodine imparts a greenish-blue color to the white granules. The color produced by a different number of squeezes of the bulb is compared with a standard color scale, and the amount of carbon monoxide estimated.

Another detector warns of the health hazards from hydrogen sulphide. Its basis is the reaction of silver cyanide with hydrogen sulphide. The latest of these instruments is the mercury vapor detector.

Other items of industrial safety include respirators for protection from smoke, flame, and chemical fumes; safety hats and helmets to prevent skull injuries; shields to protect the worker's skin and his eyes from injurious light rays; pads for the stomach to prevent injury from wood thrown from a saw, and protective coverings for arms, fingers, hands, and legs.

For example, if a packing-house butcher were to don all the equipment worn for

(Continued to page 155A)



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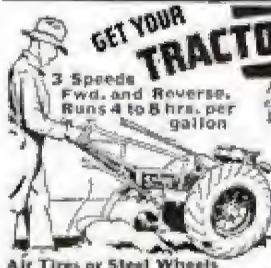


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Prove it ends drudgery and dirt of coal or wood; cuts fuel bills in half, pays for itself quickly by what IT SAVES.

**FREE SAMPLE FOR AGENTS**

offered to one energetic man or woman in each locality

who will demonstrate and take orders. Write quick, be first to learn how to

make **REAL MONEY** right now, spare or full time—mail to postcard today.

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**EASY—PROFITABLE—INTERESTING WORK!**

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☐ Send FREE plan and special offer. ☐ Send new booklet, "400 YEARS OF TENNIS." Enclosed is 10c to cover mailing costs.

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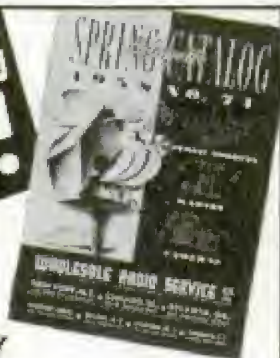
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**IT'S** out. Camera Fans—new Spring edition of the catalog that saves you **REAL** money! Latest type cameras, famous names, everything you need in photography at prices you can't beat anywhere! Don't buy that camera until you've seen this valuable **FREE** catalog. Mail the coupon for your copy today. Camera! Action!

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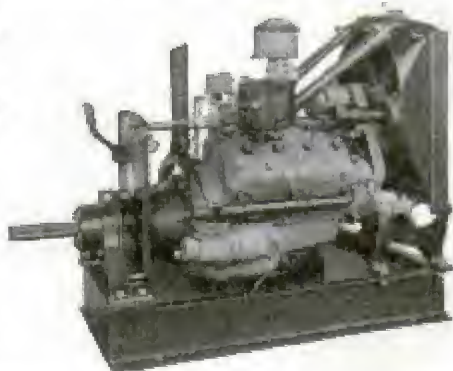
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## CAN YOU BEAT THESE POWER COSTS?

**SAVE**  
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Per  
Month  
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## with a KRW FORD V8 Unit

50 H. P. with KRW V8 Unit using natural gas (1125 BTU)  
@ 30c per 1000 cu. ft. .... \$ 46.80 per month  
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(no tax) ..... \$ 145.60 per month

Above figures show primary fuel costs (lubricating oil not included) for operating a KRW V8 Unit to develop 50 H. P. for 10 hours per day—26 days per month. Compare this with electricity @ 3¢ per KWH which amounts to \$340.60 per month. You can pay for a KRW Unit in a few short weeks **out of actual savings!**

KRW V8 Units are daily saving money for operators of air conditioning and refrigeration equipment, mills, factories, shops, welders, compressors, pumps, well-drilling outfits, contractors' equipment, etc., etc.

For complete information, prices and data write us. You can buy through your local Ford Dealer and benefit by local service and low-cost Ford engine replacement feature.

**K. R. WILSON** 17 Lock St. **BUFFALO, N.Y.**  
Builders of Shop Equipment for Ford Dealers Since 1916  
West Coast Branch: 722 Mateo St., Los Angeles.  
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Send for **FREE** book describing the Perfect Photo Enlarger. Has **EVERYTHING!** Price **\$9.90** complete with fine lens. Money back guarantee.

### PERFECT ENLARGER COMPANY

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## EARN BIG PROFITS with new RANGER SCOOTER

Earn big profits selling or renting marvelous, improved **RANGER SCOOTER**. 120 miles per gallon—30 m.p.h. Safe. Sturdy. Good territory still open. Get your share of the big profits possible! **EASY TERMS FINANCED.** Write for Free folder, Special Low Agents' Prices. **Hurry!**

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## WOODSTOCK TYPEWRITERS

## Metal Castings Schools and Craftsmen

Make your own castings of aluminum, copper, bronze, silver, brass. Outfit contains gas furnace with 110 volt, universal motor blower, moulding sand, crucibles, tongs, rubber hose, flask, parting materials and instructions for use. For making models, trays, dishes, art objects, tools, shop equipment, etc.; also used for forging, heat hardening and heat treating. Three outfits available, \$18.50, \$19.00 and \$27.50. Further details April issue, Page 158A. Prices f.o.b. K. C. Mo. Weights 25, 40 and 65 lbs. Check or money order acceptable, express charges C.O.D. Write for Free Circular.

### KANSAS CITY SPECIALTIES CO.

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## ...ITALIAN... ACCORDIONS

Latest Models — Buy direct from factory representative at **lowest WHOLESALE PRICES**. Save One Half. Used musical instruments taken in trade. Write now. **ITALIAN ACCORDION MFG. CO., 323 W. Polk St., Dept. M-2 Chicago**



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NATIONALLY ADVERTISED 8MM and 16MM Movie cameras, projectors. For home, business, church, school, club. **MONEY BACK 10 DAY TRIAL**. Payments as low as 10¢ A DAY. Satisfied customers throughout the world. **FREE details. WHITE TODAY.** Don Elder's Home Movies, Dept. A-5, 739 Bayview St., Boston, Mass.

## NEW BIG TRAILER PARTS CATALOG

Shows hundreds of house trailer items. Build your own trailer or re-condition the one you have. Wholesale prices. Quality merchandise. Prompt shipment. Send 10¢ for this money saving catalog today. **C. M. Hoof Company, 1736 S. Michigan Ave., Dept. P-5, Chicago, Ill.**

## EXPERIMENTERS

Headquarters for invaluable electrical information and hard-to-get materials in any quantity. Send for free catalog. **S. W. Duncan, 410 S. Hoyne Ave., Chicago**

## YOU'LL LIKE RESILVERING MIRRORS, REFINISHING

Plated articles, Autoparts, Reflectors, Tableware. Making Chipped Glass Name Plates, Signs. Experience Unnecessary. Write. **SPRINKLE, Plater, 129, Marion, Indiana**



## Earn Cash at Home!

We paid M. M. \$1174 for exceptional cellar crop Snow-King mushrooms! We furnish materials; buy all crops. Big **FREE** picture book tells if your cellar, shed, suitable. **Act now.** Write today. **United Co., 3848 Lincoln Av., Dept. 300, Chicago**



(Continued from page 152A)

different jobs in his plant he would resemble a knight in full armor. A hard fiber helmet is worn in departments where meat travels on an overhead conveyor. To preclude being cut, a leather apron, leather and mesh forearm guards, and finger guards are standard equipment. Boots have non-slip soles and heels and metal-capped toes; knives have a safety guard between the handle and the blade.

Many savings in accident costs have been brought about by dressing exposed moving parts of machines with guards. Adequate lighting also has proved a valuable ally in the fight on accidents. Damage claims have been decreased as much as forty per cent in manufacturing plants by revamping the illumination system.

Although this accent on safety practices has cut the number of industrial deaths to less than half the 1913 figure, the safety engineers cannot rest on their laurels. Destructive machinery is constantly being developed ahead of the techniques for controlling it and new applications of science are being brought into industry before their dangers can be fully studied.

The safety engineer has found the farm a fertile field. Agriculture hasn't paid much attention to safety methods and statistics show that it is the country's most hazardous industry. And the principal cause of accidents on the farm as in other lines is carelessness!

## Automatic Switch for Car Radio Raises Volume by Air Speed

Raising or lowering the volume of the automobile radio according to driving conditions, an automatic switch available on 1938 Oldsmobile cars utilizes the variation in air speed created by the engine fan. Turned up to compete with engine noise during fast driving on the open road, the radio must be quieted when the car slows down in town or at intersections. The switch performs this duty automatically. A slightly curved vane extends into the air stream from the motor fan, and at approximately fifty-seven miles an hour the air pressure moves the vane backward, closing the booster switch and lifting the radio volume. As car speed decreases the vane moves forward and breaks the booster circuit.

## SINGLE SHAFT Means REVERSE

Johnson Sea-Horses are the only outboard motors that give you 360° steering and REVERSE! They are modern motors, with all the modern developments, including patented co-pilot, underwater exhaust, perfect alternate firing. Also Ready-Pull Starter models.

**FREE** WRITE for your copy of the new Sea-Horse Handy Chart. It describes Johnson's 9 great models for 1938!

JOHNSON MOTORS  
400 PERSHING ROAD  
WAUKEGAN, ILLINOIS

*New*  
**\$49.50**  
17 lbs.

**JOHNSON** *Sea-horse*  
OUTBOARD MOTORS



## BE at Home ON STRANGE ROADS

With a Hull Auto Compass you never get confused on strange country roads or city streets. It always tells your direction of travel, saving you miles, money, worry and delays at a cost of only \$2.95 at your dealer. Two-piece model \$1.95. Write for circular.

HULL MFG. CO., P. O. Box 246-D1, WARREN, OHIO



## TAKE-ABOUT SANDERS

Give every job an expert finish in minutes  
Instead of hours

Don't let slow, tiresome, tedious hand sanding and scraping spoil your finishing and refinishing pleasure. Do it this modern, efficient way with a Take-About. No experience necessary, just plug it into the nearest light socket and it will do your job in a jiffy. Use it on straight or slightly curved surfaces. Use the front pulley as a spindle sander on curved work.

Used in thousands of schools for instruction and refinishing desks and other maintenance work.

WRITE FOR DETAILS, PRICES AND TERMS TODAY

**PORTER-CABLE-MACHINE CO.**

Precision Tools Since 1906

2000-5 N. SALINA ST.

SYRACUSE, N. Y.





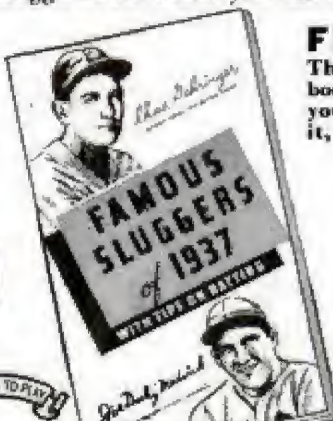
Louisville Sluggers were used and endorsed by these and other outstanding players in 1937

**MEL OTT**  
**RUDY YORK**  
**LOU GEHRIG**  
**ZEKE BONURA**  
**JOE DI MAGGIO**  
**HANK GREENBERG**  
**JOE "DUCKY" MEDWICK**



# ASK YOUR DEALER to show you a genuine *Dehringer* LOUISVILLE SLUGGER

Only genuine Louisville Slugger bats carry the famous Louisville Slugger Oval Trade Mark and the name of an outstanding baseball star in his own handwriting on the barrel end of the bat. Your dealer carries a full line of famous Louisville Sluggers from which you can select your favorite player's model.



**FREE AT YOUR DEALER'S**  
 The 1938 edition of the "Famous Slugger" booklet with Tips on Batting is now ready. Ask your dealer for a free copy. If he does not have it, send 5c in stamps and we will mail it direct.

HILLERICH & BRADSBY CO.  
 LOUISVILLE, KY. Dept. P-31

*Autographed*  
**LOUISVILLE SLUGGER BATS**

## HOW TO BEAUTIFY YOUR PROJECTS WITH **GOLD LEAF** SEND FOR **FREE** BOOKLET

describing method of application and 101 suggested home-workshop projects using gold leaf; also information on how to get a Hastings Home Workshop Gold Leaf Kit.  
**HASTINGS & CO., 221 Filbert St., Philadelphia, Pa.**

## A CANDID CAMERA For 10 days ON APPROVAL!

**Speed..Action..Excitement**

Catch it all with this mighty little Candid Camera! You won't believe it possible at this low price, so we want you to try it out at our risk! Take all the pictures you want, under any conditions. Test out the remarkable clarity of the lens... the accuracy of the view finder. Compare it in action with any of the cameras selling for \$10 or \$20. Then, if you do not think this is the most remarkable camera bargain you ever saw, it won't cost you a penny! Fully corrected Wollensak 50 M.M. lens. Speed shutter. Fixed focus makes it possible to get sharp pictures at all times. Telescopic finder. Tripod Socket. Uses economical 127 V.L. or Asia A-8 film in color or black and white. 18 pictures on a roll. Has Compartment for extra roll of film. Enlarge clearly up to 8"x10". ORDER NOW for special introductory Price of only \$3.98 Postpaid. C. O. D. if preferred, plus postage.



**\$3.98 ONLY**

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## THE GADGET KIT

Great assortment of useful parts for inventors, model makers, mechanics, mfrs., craftsmen—every one! 10 lbs. of screws, nuts, washers, lugs, rivets, bolts, bushings, springs, tapping screws—many other items. Over 1,000 parts—worth \$7.00. Big Bargain—only \$1.49. Money back guarantee. Order your kit today.

**MANUFACTURERS SUPPLY HOUSE**  
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**HANDY TAP and DIES . . .**  
 Accurate—carefully hardened and tempered. Complete range of sizes at your local five and ten cent store.  
**HENRY L. HANSON, WORCESTER, MASS.**

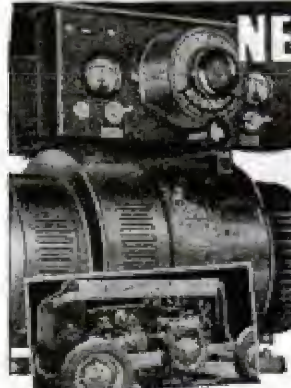
## "BUCKET" Design HAND PUMPS

that have Automatic take-up-for-wear. Same principle as our large rotary power pumps. Just the "ticket" for pumping oil, gas, paints, etc., from drums and barrels. Large capacities—no priming. WRITE for FREE BULLETIN showing 14 Different Models at LOW PRICE.



**BLACKMER PUMP CO.** 1803 CENTURY AVE. GRAND RAPIDS, MICH.

## NEW PROFITS IN 40 VOLT ARC WELDING \$150 to \$300 Extra Profit Monthly



**"BUILD YOUR OWN WELDER!"**

New low prices make this profitable welding service available to everyone. Opens doors to big pay jobs that carry real profit. Hobart Welders are easier to operate, faster, guaranteed to bring you quality welding business.

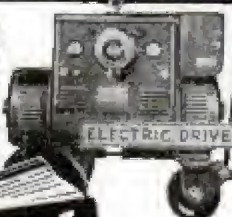
... extra profits will pay for welder without expense to you. Special "Build-Your-Own" generator mounted on trailer with auto engine lets you operate any place. Saves \$300 to \$500 over factory built units.

**HOBART BROS., Box M52**

**TROY, OHIO**

Gentlemen: Send me information on ( ) Build Your Own Welder ( ) Electric Drive Welder ( ) 30 Days Trial, Easy Terms ( ) Rental Plan. Also send me free books I've checked.

Name.....  
 Address.....



**Free!**  
 VALUABLE WELDING BOOKS—CHECK THEM

**30 DAYS TRIAL AT OUR RISK**

Pays for itself Terms

- ☐ How to "Build-Your-Own"
- ☐ New Profits in Arc Welding
- ☐ New Arc Welding Catalog

**HOBART**

THE FASTEST SELLING WELDER ON THE MARKET TODAY

**No Investment Terms Profits Pay for It**

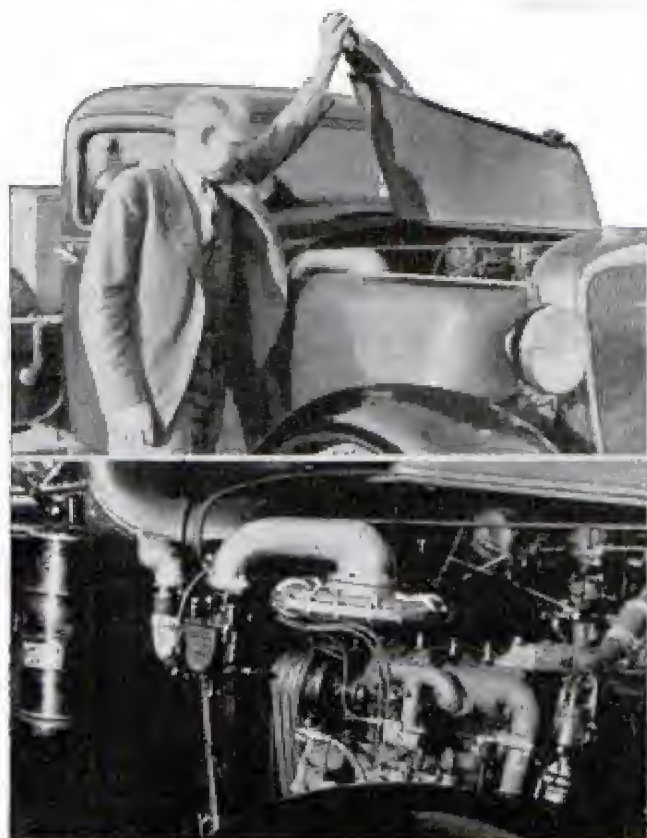
Extra earnings and savings possible with Hobart Welders make it easy to own without expense. You can even rent a new Hobart and later purchase it without loss. Coupon brings details.





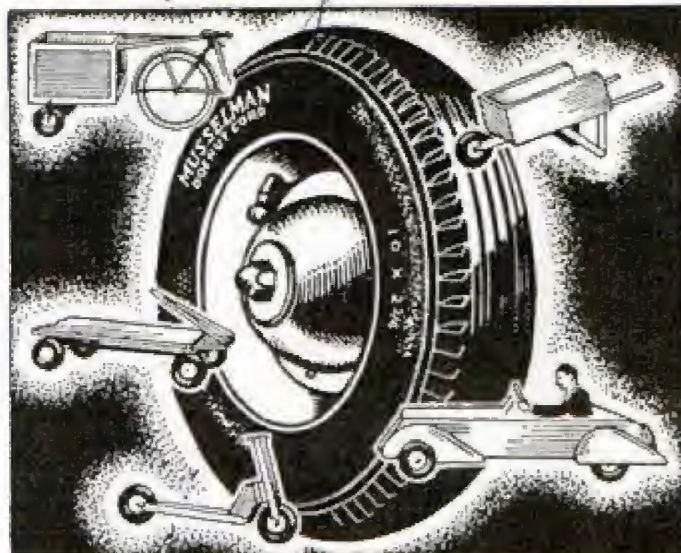
*Box 698, Escondido, Calif.*

## Supercharger for Truck Saves Time on the Road



Top, side of hood is rounded to accommodate supercharger motor shown in bottom photo

Trucks equipped with a variable pressure supercharger can climb hills and go through traffic with less gear shifting than those not fitted with such devices. Thus, faster time between terminals is made possible. The unit consists of a centrifugal-type supercharger that delivers up to 1,200 pounds of air per hour at six pounds pressure per square inch. The rotating fan has a top speed of 21,000 revolutions per minute. It is driven by a small independent eighteen-horsepower gasoline engine mounted beside the truck motor. The supercharger increases the horsepower of the main engine by approximately thirty per cent, with no loss of power at altitude. It is used only when road conditions prevent the driver from holding the engine speed desired in high gear. In a test run of 220 miles, with an eighty-three-horsepower truck having a gross weight with a load of 14,500 pounds, use of the supercharger permitted making the run in 356 minutes, a saving of one hour and fifteen minutes over the time made by the same truck when unsupercharged. In both cases, the top speed was held at forty-two miles per hour.



## Build it with DOENUTS and our BLUE PRINT DRAWINGS

Build your wheelbarrow, scooter, express wagon, bicycle trailer or midget auto with the most remarkable tire and wheel ever invented for such uses. Designed and patented by the originator of the airwheel for airplanes. Single tube cord construction. Operates as low as 15 lbs. air pressure. Absorbs road shocks, eliminates jolts and coasts 25% to 50% farther. Handles the same loads with less than half the effort. Tire size 10" x 2 3/4". Large size 12" x 3.30". Any boy can build all of the 5 vehicles shown, with our simple blue print drawings. Send 25c for drawing of any one vehicle or 50c for all 5 drawings. Write for free illustrated folder.

**MUSSELMAN PRODUCTS COMPANY**  
6247-A St. Clair Ave. Cleveland, Ohio

## LINOLEUM ENGRAVERS

Amateurs — Journeymen — Artists — Printers

### MAKE BETTER PLATES WITH COMPO-LIN

The latest and most satisfactory development in engraving linoleum. (See April issue of Popular Mechanics, page 497). These practical, low priced blocks, mounted type-high, permit beautiful stipple work, color tones and perfection of detail hitherto impossible in the old-fashioned linoleum block. Do not "pit" nor "crumble"; give sharp, clear impressions and are good for runs of 25,000 or more. Easier and more satisfactory to engrave than rubber or wood. Write TODAY for prices and detailed information. Special discounts to DEALERS.

## Clayson-Lloyd Company

216 West Jackson Blvd. Chicago, Illinois

**NOW GROW REAL ROOTS ON CUTTINGS!**  
FASTER · SURER · CHEAPER!

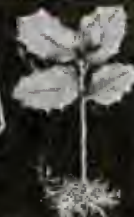
### with AUXILIN

#### THE MODERN ROOT GROWER

Treat cuttings from plants, shrubs, trees, and see how roots spring out. Faster growth. Less loss. Quicker blossoms. Less time. Less cost. Excellent on roses. Cut flowers will last much longer if a few drops of Auxilin are placed in the water. Full directions, no skill needed. Astonish yourself and your friends.

**AUXILIN**  
On sale at seed, hardware, and other stores or send 50c for bottle (will treat up to 500 cuttings). \$1.00 for larger size. Sent postpaid.

Write today—Department P.M.  
Pennsylvania Chemical Corporation • Orange, N. J.



Above shows photo of American Holly rooted in 4 weeks. An astonishing performance!



# OIL TAKES A HOLIDAY



BEST FOR  
LOCKS AND  
FIREARMS

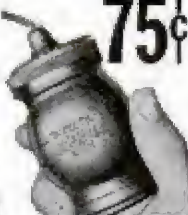
Millions of users know Graphite in dry form is longer-lasting and far superior to oil or grease for thousands of miscellaneous lubricating applications. Heat, cold, water, oil, other solvents, pressures, and speeds cannot destroy or displace it. Never hardens, gums, drips, smells, or fails... In other applications, Graphite added to oil or grease makes the truly super-lubricant. A "shot" of Graphite makes everything work, run, or operate noiselessly; drives and keeps out power-wasting friction. Keep a "Gun" near you for daily use in your home, car, work or play.

## JUNIOR MODEL 30¢

Made of Flexophane—throw away when empty—contains 900 applications—individually mounted on directions—and display card.

## RUBBER MODEL REFILLABLE 75¢

Lasting, durable construction—for shop, bench and all servicing—often preferred by mechanics. 8 refills cost only 50¢. Full directions on wrapper.



JUST SQUEEZE!

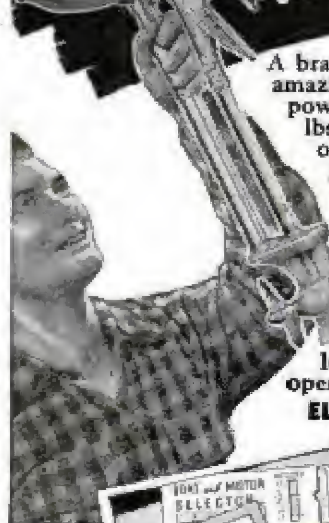
Users, dealers, jobbers: write Dept. C-G 26 JOSEPH DIXON CRUCIBLE CO., JERSEY CITY, N. J.



DIXON'S GRAPH-AIR GUNS AND MICROFVNE GRAPHITE  
PATENTED U. S. AND FOREIGN COUNTRIES

Thrilling NEW

# EVINRUDE "Ranger" ONLY \$47.50



A brand new Evinrude... amazingly light, handy and powerful. Weighs only 16 lbs., and cruises 3 hours on a single fill! Literally packed with big-value features including famed Hooded Power—Evinrude Co-Pilot—Underwater Silencing. Starts instantly!—spins into action with a flick of the starting cord. Costs less than 3¢ an hour to operate. Send for catalog!

ELTO PAL only \$37.50

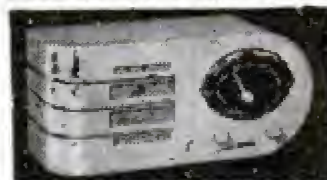
Elto PAL (built by Evinrude) weighs only 14 pounds, and drives boats at twice the speed of oars. Elto ACE, \$47.50—the husky Handi-twin, only \$67.50. Each an outstanding value! Address EVINRUDE MOTORS, 5462 N. 27th St. Milwaukee. Prices F. O. B. Factory

FREE Catalogs! Write for 1938 Evinrude and Elto catalogs... Be Director of Boat-and-Motor Selector.



EVINRUDE OUTBOARD MOTORS

## NEW! IVORY ZEPHYR RADIO



Lots of \$10.75 Sample \$11.30 FULLY GUARANTEED

Another "scop" for ZEPHYR is this marvellously beautiful new radio with beautiful chromium bands and illuminated red and green dial. 5-tube AC-DC, short-wave switch, full 8-inch electro-dynamic speaker, self-contained aerial, size 15" x 7 1/2" x 5 1/4". RCA Licensed.

\$14.45 CLEAR PROFIT

On salescard plan giving away radio free. Send 10¢ for sample salescard and plan.

1938 Catalogue FREE 53 MODELS—LOWEST PRICES. All-wave Radio that set Europe. Automatic Tuning. Car, Farm, and Beautiful Console Radios with 16 tube circuits. Write for your Catalog NOW.

INSPECT IT FREE! Rush \$2.00 deposit for sample. Pay balance C.O.D. If not completely satisfied, return radio within 10 days for full prompt refund.

J. M. Bregstone & Co. 536 S. Clark St. Chicago, Ill.

## SERA'MO AMAZING NEW POTTERY CLAY

... fired in your Kitchen Oven

EASY to shape! Fire in kitchen oven. Make beautiful vases, plaques, art objects, etc. inexpensively. 1 lb. 25¢, 5 lbs. \$1.00. ORDER TODAY. FAVOR RUHL & CO., 425 S. Wabash Ave., Chicago, Ill.

See Article April Popular Mechanics—Page 611

For Economy BUY — For Income SELL

The FIFEL-GEARED PLIERENCH KIT



NEW 7" and 8 1/2" Sizes — Each with 3 instantly changeable Jaws A \$50 Service at the Cost of One Tool! Mail this Ad Today with your address Get FREE—7-Edge End-Angle



Screwdriver, 101 Picture Manual of Mechanics, with User Offer, or Distributor Territory and Demo. Kit Offer. Be a Plierench Man, They're making \$35 to \$85 Weekly!

AMERICAN PLIERENCH CORP'N

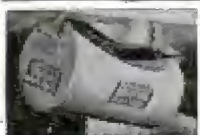
PME — 4511 No. Ravenswood Ave. CHICAGO, ILL.

## Outstanding . . . SKOOT - MOBILE

America's Finest Motorized Scooter

WRITE FOR FREE LITERATURE

See our advertisement page 145A April 1938 Popular Mechanics Quality Hardware & Mch. Corp., 5839 Ravenswood Ave., Chicago, Ill.



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Great fun—learn to be a good swimmer. Develop stroke and kick. Sure-Swim keeps body in proper position. Prevents drowning. Enables good swimmer to be better and poor swimmer to be good. Can't leak. Can't get water soaked. Can't slip. Full freedom of arms and legs. Get full information FREE. PADL-EZE SALES, INC. 1036 W. Mitchell St., Milwaukee, Wis.

## YOU'LL FIND a lot of valuable information when you have read

our new booklet, "A File For Every Purpose." Free on request. Send for it to-day. Nicholson File Company, Providence, R. I., U. S. A. ● A FILE FOR EVERY PURPOSE

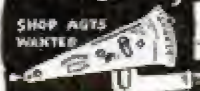


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Lowest prices in the trailer industry, for windows, couplers, lifting devices and other items. Catalog Free. Write today.

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For Machine and Tool Work and Quick Set-ups. Price \$5. Send for descriptive literature.

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## SPARE TIME MONEY . . .

There's a big demand for the many hand-tooled articles you can make with the Eases Leathercraft Set. Easily learn to make good money in your spare time. Complete outfit including tools, leathers, patterns, etc., and full instructions, only \$2.00—on sale at leading Department Stores or order direct and pay postman on arrival, \$2.50 outside U. S.

## LEATHERCRAFT

Free When ordering direct, clip name of your Department Store to this ad, and we will include with your set, one extra free project. Illustrated catalogue 10¢.

E. A. SWEET CO. Dept. A-12 Binghamton, N. Y.



## Water-Cooled Motorcycle Engine Sets Speed Record



This streamline motorcycle has water-cooled engine which enabled driver to set record

Equipped with a 250-cubic centimeter, water-cooled engine, a German motorcycle was driven recently to a world's record of 114 miles per hour, with flying start. The motorcycle is streamline in accordance with latest racing principles. It was displayed at the international automobile and motorcycle show at Berlin.

## Control of Gravitation by Man Would Be Greatest Invention

Looking into the future of invention, a British engineer predicts that man may some-day discover how to control gravitation—a revolutionary inventive step that would have a greater effect on human living conditions than any previous discovery. He foresees steam power for huge aircraft, and the transmission of power through the air. Airplanes could be flown without fuel, drawing their power from beams of energy radiated along their routes. Some measure of weather control on a wide scale may one day be possible, radio will permit men to see and speak to each other throughout the world, and production machinery will become so thoroughly automatic that man's needs will be turned out with very few hours of work by the individual.

## NEW KIND OF WORK GLOVE

Full Grain Wolverine Horsehide

Pony-white Horsehide  
Driver's Slip-on  
Pattern No. 8565



### DRIES SOFT . . . STAYS SOFT!

They'll never get stiff and clumsy no matter how much they're soaked! They're triple-tanned by a secret process that makes Full Grain Horsehide soft as baby lambskin! Mighty comfortable. Plenty tough! Heat-proof. Steam-proof. A bulldog can't rip 'em. Seams lock-stitched with 4-cord work-shoe thread. Get a pair at your dealer's today. If he can't supply you, send us his name and 75c, and we'll mail you a pair postpaid. Ask for special offer No. 8565. Sizes 8 to 12. You'll swear Wolverines are the swellest work gloves in the world! They're made by the makers of famous Wolverine Shell Horsehide Work Shoes.

WOLVERINE SHOE & TANNING CORP., Dept. P5-38, Rockford, Mich.

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A new Lathe designed for those who want a high quality Lathe at a low price. Bed, headstock and tailstock are made of high quality, gray iron castings, machined to the same close tolerances as all other Duro tools. The large self-lubricating bearings are mounted directly in the headstock, no die cast bearing mountings to wear and cause misalignment.

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No. 41S-YA, 9 $\frac{1}{4}$ " swing by 3' bed Workshop Bench Lathe with Horizontal Motor Driven Adjustable Countershaft,  $\frac{1}{4}$  h.p. Reversing Motor, Switch and Belts. \$115 Down—\$6 Monthly for 18 Months) **\$117.00**

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Features include—Twin Gear Reverse to Lead Screw, Ball Thrust Bearing on Spindle, Automatic Longitudinal Screw Feed to Carriage, Precision Lead Screw for cutting screw threads from 4 to 112 per inch,  $\frac{3}{4}$ -inch hole through spindle taking collets up to  $\frac{1}{2}$ -inch, V-ways on lathe bed.

38 attachments are available for milling, grinding, draw-in collet chuck work, taper work, and many other operations. Made in 3', 3 $\frac{1}{2}$ ', 4', and 4 $\frac{1}{2}$ ' bed lengths. Costs less than 2 cents per hour operating from ordinary lamp socket.

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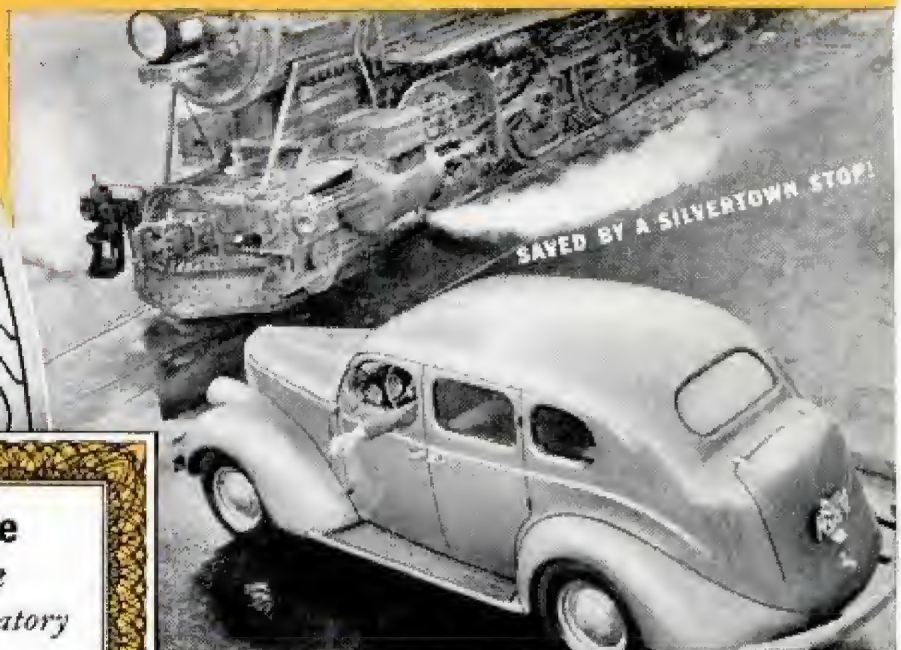


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GIVES THE *QUICKEST* NON-SKID STOPS YOU'VE EVER SEEN!



## Here's the Evidence

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"BOTH regular, and also the premium-priced tires of America's six largest tire manufacturers were submitted to a series of exhaustive road tests made over a three months' period by us, to determine their resistance to skidding and wear, with the following results:

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## Wins Hands Down in Competitive Road Tests by Famous Testing Laboratory

AGAIN Goodrich makes tire history! With a new Goodrich Silvertown that is really *two* great tires in one! For *inside* the tire is Golden Ply protection against high-speed blow-outs. And *outside* is the new Life-Saver Tread that, in exhaustive road tests by the impartial Pittsburgh Testing Laboratory, gave "greater skid resistance than any other tire tested."

This tread is actually a *road dryer*! Its never-ending spiral bars, acting like a battery of windshield wipers, sweep water from under the tire, force it out through the *deep* drainage grooves—make a *dry track* for the rubber to grip.

### No Extra Cost!

Go to your Goodrich dealer or Goodrich Silvertown Store for a *free* demonstration. Remember, this new skid-protected Goodrich Silvertown also has the famous Golden Ply protection against blow-outs. So you get *two* great life-saving features—AT NO EXTRA COST!—to say nothing of 19.1% greater non-skid tire mileage—which means you get EVERY 6TH MILE FREE!

*The new* Goodrich SAFETY Silvertown

SKID PROTECTION OF LIFE-SAVER TREAD ◆ ◆ ◆ GOLDEN PLY BLOW-OUT PROTECTION



MEL KOONTZ—FAMOUS HOLLYWOOD ANIMAL TAMER—WRESTLES A LION!



Here is Mel Koontz in the cage with four hundred and fifty pounds of lion. Man and lion clinch while onlookers' nerves grow tense. Even with

the lion's jaw only inches from his throat, Mel Koontz shows himself complete master of the beast. No doubt about *his* nerves being healthy!

"I'll say it  
makes a  
difference to  
me what  
cigarette  
I smoke"

says

MEL KOONTZ to  
PENN PHILLIPS

PEOPLE DO APPRECIATE THE  
**COSTLIER TOBACCOS**  
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THEY ARE THE  
**LARGEST-SELLING**  
CIGARETTE IN AMERICA



"I guess you *have* to  
be particular about  
your cigarette, Mel.  
Are Camels dif-  
ferent from  
other kinds?"

"Take it from me, Penn, any one-cigarette's-  
as-good-as-another talk is the bunk. There  
are a lot of angles to consider in smoking.  
Camel is the cigarette I know really *agrees*  
with me on all counts. My hat's off to 'em  
for real mildness—the kind that doesn't get  
my nerves ragged, or make my throat raspy."

MEL KOONTZ was schooling a "big cat" when Penn Phillips got talking cigarettes with him. Mel gives his slant, above. And millions of other men and women find what they want in Camels. Yes, those *costlier tobaccos* in Camels *do* make a difference!

Camels are a matchless  
blend of finer, **MORE**  
**EXPENSIVE TOBACCOS**  
—Turkish and Domestic

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ONE SMOKER TELLS ANOTHER...

"Camels  
agree with  
me"